MAY, 1956

Commercial Fertilizer

and PLANT FOOD INDUSTRY

With The *Kraftpacker*

Kraft Bag Corporation

hands you bag filling perfection on a silver tray!

ACCURACY

The Kraftpacker guarantees an 8 oz. plus or minus tolerance—but actually delivers a daily average closer to 4 oz.!

HIGH PRODUCTION

Plants with Kraftpacker installations report filling 18 to 22 80 or 100 lb. charges a minute, with one man hanging bags—and a daily average of 40 tons per hour, with 10 to 12 change-overs.

SIMPLICITY

No automatic open mouth bag filling machine of its type will handle free-flowing material easier than The Kraftpacker. Reduces packaging costs at an unbelievable rate.

ECONOMY

The Kraftpacker is a proved money-saver in every way—costs less to buy, less to install, less to maintain.

and . . .

with Kraft Bag Corporation's integrated 2-plant multiwall bag manufacturing facilities, you have *everything* you need for your packaging operation, from one dependable source!

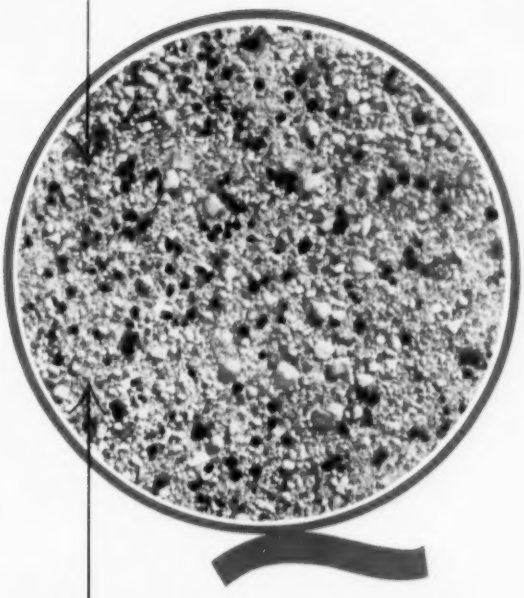
Ask for representative . . . or brochure

KRAFT BAG CORPORATION

Gilman Paper Company Subsidiary

630 Fifth Ave., New York 20, N. Y.

Western Sales Office: Daily News Bldg., Chicago 6, Ill.



Customers

CAN

See

UALITY

in

Fertilizer

If It Contains

SMIROW

TANKAGE

PLAINLY VISIBLE in any good fertilizer mixture are the dark organic particles of Smirow . . . a sales feature easy to point out, and a satisfying mark of quality to farmers.

100% natural organic, 90% water insoluble, 90% available.

Let us figure the cost of SMIROW delivered to your plant.

SMITH-ROWLAND COMPANY

A DIVISION OF SMITH-DOUGLASS CO., INCORPORATED

NORFOLK, VIRGINIA · GRANITE CITY, ILLINOIS

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and PLANT FOOD INDUSTRY

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Commenting Freely

by Bruce Moran

Slowly but surely the idea of prophylaxis on the farm is moving toward the crops themselves. Naturally the idea of preventing pests before they strike takes hold quickly. It is an obvious benefit.

The fact that approved fertilization is also a preventive of trouble is not so easy to grasp. But it, too, is taking hold on the farm. When the leaf shows specific starvation symptoms it is not too late to correct, of course. But the whole progress of the crop is slowed, and the yield is reduced when such symptoms are permitted to creep into the field.

Nor can we know whether the season will be one of drought or flood, of searing heat or unseasonal cold. But we can be sure that good fertilizing practice will help the crop through any of these extremes . . . and we can encourage that kind of farm prophylaxis.

If we do this we will only be doing our duty toward the farmer who is so vital to the rest of the Nation . . . and our customer!

TIME TO GET SET

with

WEATHERLY CONTROLLED GRANULATION

for the

1956-57 SEASON!

Full operation in widely scattered plants has demonstrated that Weatherly Granulated mixed goods sell better because of close sizing and uniform analysis. So the Weatherly Process has become the standard of the industry—the most talked about and the most completely accepted method in the field.

Weatherly equipment is rugged, heavy duty. From the lowest cost materials it turns out a high volume of high quality goods — sized to pass through 6 mesh and be retained on 16 mesh screen.

So Weatherly installations are producing more quality tonnage, plant for plant, than any other . . . a fact you can see for yourself, if you like, in plants near you. Talk to owners of Weatherly converted plants yourself, and then let us get your plant ready for the coming season.

Standard of the Industry!

Weatherly Controlled Granulation ***20–60 tons per hour***

The D. M. WEATHERLY COMPANY

Industrial Engineers and Builders

830 Ponce de Leon Ave., N.E., Atlanta, Georgia PHONE: EMerson 7986

In just one year...

over ¼ million tons have switched

Round-the-clock production at Bonnie takes the push out of peak-season demands. Mammoth off-season storage capacity swallows up the seven-day-a-week production, stores it safely until you need it. And the industry's finest delivery schedules assure you high-quality triple when you need it.

International's natural curing helps you cut costs

• It's the natural curing process that gives you that "something-extra" quality of the triple super from Bonnie.

It helps you cut costs . . . gives you better control of manufacturing conditions and chemical reactions . . . stabilizes your formulation problems . . . and reduces the delivered unit cost of (P_2O_5). Here's what natural curing means to you:

Uniform particle size . . . for dependable ammoniation results.

Finer texture . . . for more complete ammoniation in every batch.

Stabilized product . . . for better chemical control.

Constant high analysis . . . with guaranteed minimum of 46% A.P.A.

Uniform high quality . . . for increased (P_2O_5) availability.

To guarantee this top quality triple from a plant as large as Bonnie required extra planning in plant design . . . extra capacity for a dependable supply . . . extra time to complete the five-week natural curing process . . . and extra care and quality control to assure uniform results in batch after batch.

This is the way Bonnie was built. And the results of the past year have proved Bonnie can deliver . . . Bonnie is dependable . . . and Bonnie can produce the kind of triple you want.

# of Triple Super Sales to Bonnie

The reason: | *trustworthy service and delivery plus superior results with International's natural-cured triple*

Yes, in a single year, International has zoomed to a top position as a supplier in the triple super industry. Here's why, in the actual words of Bonnie customers:*

Others have recommended you

"Several nitrogen producers have recommended your product to us because of its excellent ammoniation. They were right."

Missouri

You live up to delivery promises

"What we like about doing business with International is your service, particularly regarding delivery. Our material has always been shipped when requested."

Indiana

Your triple stores better

"Last September, we stored some of your triple next to competitive materials from two other suppliers. Six months later, the other two piles were set up hard enough to be blasted. Any lumps in your product could be broken with your fingers."

Minnesota

Your triple is a better product

"This is the best triple we have ever used for ammoniation."

Ontario

We get better ammoniation results

"We can put 600 lbs. of Urana 10 in with 1,400 lbs. of triple."

New York

Your Triple holds more nitrogen

"We have been amazed with the results. With a very high humidity we have been using 500 lbs. of nitrogen solution with 1,400 lbs. of your triple. Never before have we been able to get over 360 lbs. of this solution in the mix."

Maine

We save money with your triple

"We like the constant high analysis of your product. It aids us in formulation and reduces the unit delivered cost."

North Dakota

You meet delivery schedules

"We certainly appreciate the way International came through on schedule during the rush season."

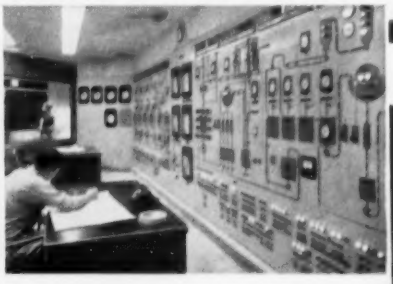
Arkansas

**names on request*

These are just a few of the reasons why this year, the big switch in triple super sales is to Bonnie — giant production facilities . . . prompt delivery . . . superior quality . . . and outstanding ammoniation results.

So this year, for a better product, and service you can depend upon, look to International Minerals & Chemical Corporation. You'll be glad you did.

This 85,000-ton curing unit — as big as two, full-sized football fields — is one example of the time and big capacity needed to produce natural-cured triple.



These "doodads" and dials get results . . . guard the uniformity and quality of every batch of triple super from Bonnie . . . help assure you of top results in ammoniation.

MINERALS International CHEMICALS

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Phosphate Chemicals Division • General Offices: 20 North Wacker Drive, Chicago 6

JUST AROUND THE CORNER *by Vernon Mount*

INFLATION . . . DEFLATION? The experts are sitting on the fence about this problem. Raw material prices, labor, credit demands, stock market, inventories . . . all these are up. But, on the other hand we are producing at an all time high rate . . . the pipelines are full and piling up on major items. And that means prices coming down.

PROFIT will be shaved between these two forces—but it looks as though a balance will be maintained. And, of course, if it looks as though things were getting out of hand, the Government has the machinery to quell the rise.

WHAT WORRIES the Government, of course, is—if the need arises—how to stop the rise without disturbing business which for the most part is enjoying the best business in history.

Yours faithfully

Vernon Mount

BONNEVILLE, LTD.

POTASH

FOR FERTILIZER MANUFACTURERS

Since 1938 Bonneville, Ltd. has been producing muriate of potash from the brines found in Utah's Lake Bonneville salt flats. The value and need of potash as primary plant food is established and BONNEVILLE POTASH has always provided the fertilizer manufacturer with a most dependable source of supply. Your BRADLEY & BAKER representative will be pleased to discuss your potash requirements.

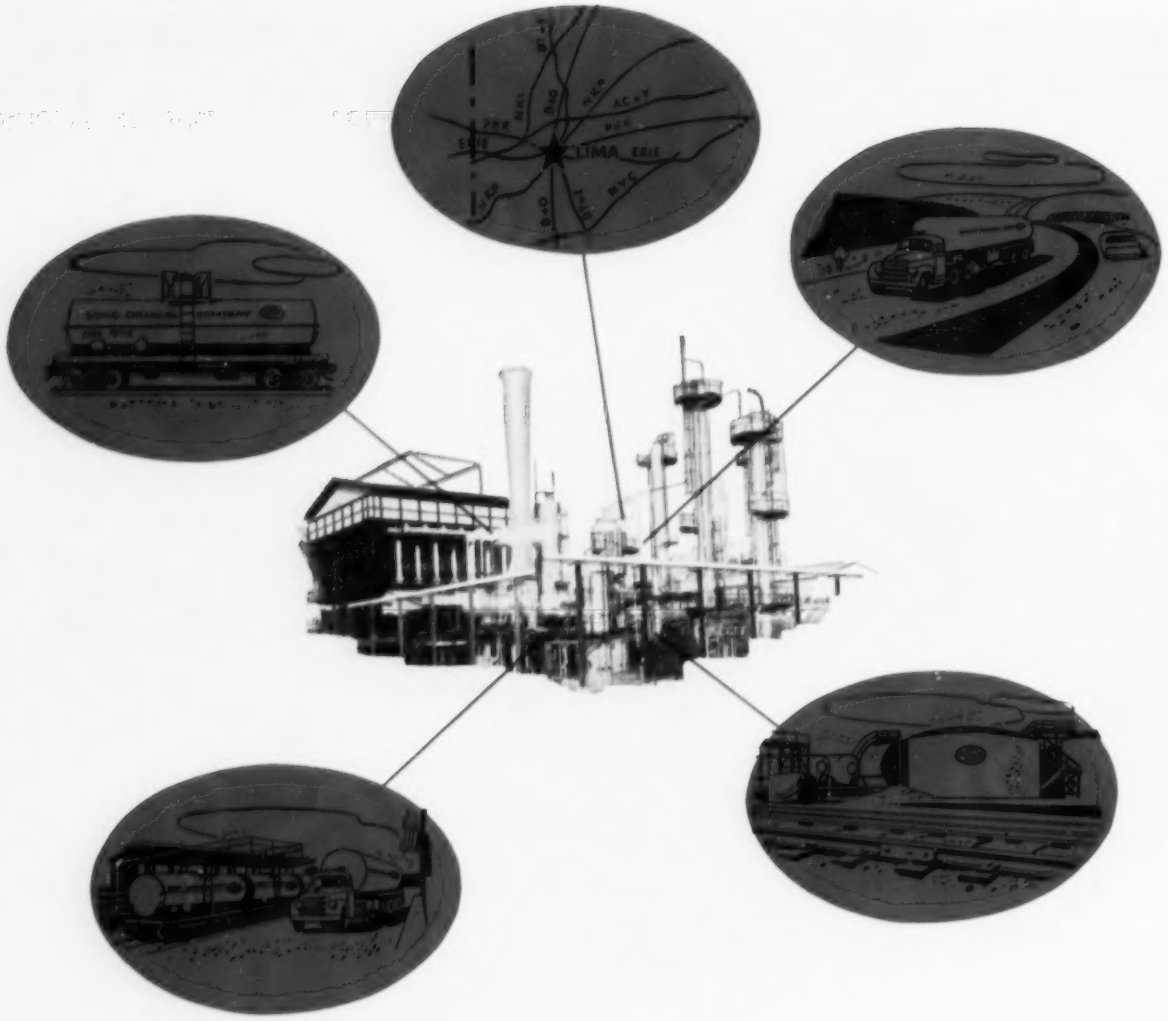
BONNEVILLE, LTD.

SALT LAKE CITY, UTAH

Represented by: **BRADLEY & BAKER**

155 EAST 44th STREET • NEW YORK 17, N. Y.

District Sales Offices: ATLANTA, GA. • INDIANAPOLIS, IND.
ST. LOUIS, MO. • NORFOLK, VA.



"Built-in" customer service

Advanced planning blue-printed Sohio's Lima plant with you — the customer — in mind. Every phase of the operation has been keyed to the smooth servicing of your orders . . . fast, efficient, dependable delivery . . . and service *when you need it.*

. . . and we're serious about service at Sohio

- **YOUR CHOICE of rail or truck delivery.**
- **SOHIO'S NEW TANK CAR fleet moves rapidly out of Lima on 5 rail lines — Nickel Plate, B&O, Erie, Penna and DT&I.**
- **REGULAR TRUCK DELIVERY within 150 miles of Lima with Sohio's new fleet of tank trucks.**
- **LARGE STORAGE AND LOADING FACILITIES that mean product for you when you want it.**
- **Anhydrous and Aqua Ammonia**
  Urea and Ammonium Nitrate Solutions
  Sohigro Urea Fertilizer Compound

SOHIO

SOHIO CHEMICAL COMPANY

FT: AMANDA RD., P. O. BOX 628, LIMA, OHIO

How a Fulton-created re-usable bag cut customer's costs over 60%

By: LOUIS J. EVEN, *Sales Manager*
New Orleans Branch
Bag Division
Fulton Bag & Cotton Mills

• Typical of problems solved by Fulton for chemical and other industries was that posed by the following requirements:

A supplier of plaster aggregate wanted a bag that would carry 100 lbs. of plaster *without sifting* . . . a bag that could be opened and emptied quickly at the job site, *and yet* be durable enough to re-use for deliveries to this job many times.

• This customer was delighted when Fulton came up with a heavy-duty Osnaburg fabric bag that could be opened and closed quickly.

These Fulton-created bags were used and re-used—over 30 times!

This cut the cost of delivering the aggregate by over 60% compared with ordinary, non-re-usable bags.

WRITE TODAY

Special Services Division
General Office
Fulton Bag & Cotton Mills
1408 Annunciation St., New Orleans, La.

We have a problem in packing _____

_____

(Please feel free to write Fulton full details in complete confidence)

Name _____

Company _____

Address _____

City _____

Investigate whether Fulton can solve a problem for you.

Fulton
BAG & COTTON MILLS

ATLANTA • CHICAGO • DALLAS • DENVER • KANSAS CITY
LOS ANGELES • MINNEAPOLIS • NEW ORLEANS • NEW YORK
OKLAHOMA CITY • PHOENIX • ST. LOUIS • SAN FRANCISCO
SAVANNAH • WINTER HAVEN

FERTILIZER MANUFACTURERS:

NEW SUPERIOR GRANULAR TRIPLE SUPERPHOSPHATE FOR DIRECT APPLICATION IS NOW AVAILABLE FROM U. S. PHOSPHORIC PRODUCTS. GUARANTEED 46% A. P. A.

In addition, run-of-pile Triple Superphosphate for maximum ammoniation and coarse material for mixing purposes continue to be available for immediate shipment against your orders. Contact your nearest Bradley & Baker Sales Office for details.

U. S. PHOSPHORIC PRODUCTS
DIVISION TENNESSEE CORPORATION
Tampa, Florida

Sales Agents: **BRADLEY & BAKER**
155 EAST 44th STREET • NEW YORK 17, N. Y.

District Sales Offices:
ATLANTA, GA.
INDIANAPOLIS, IND.
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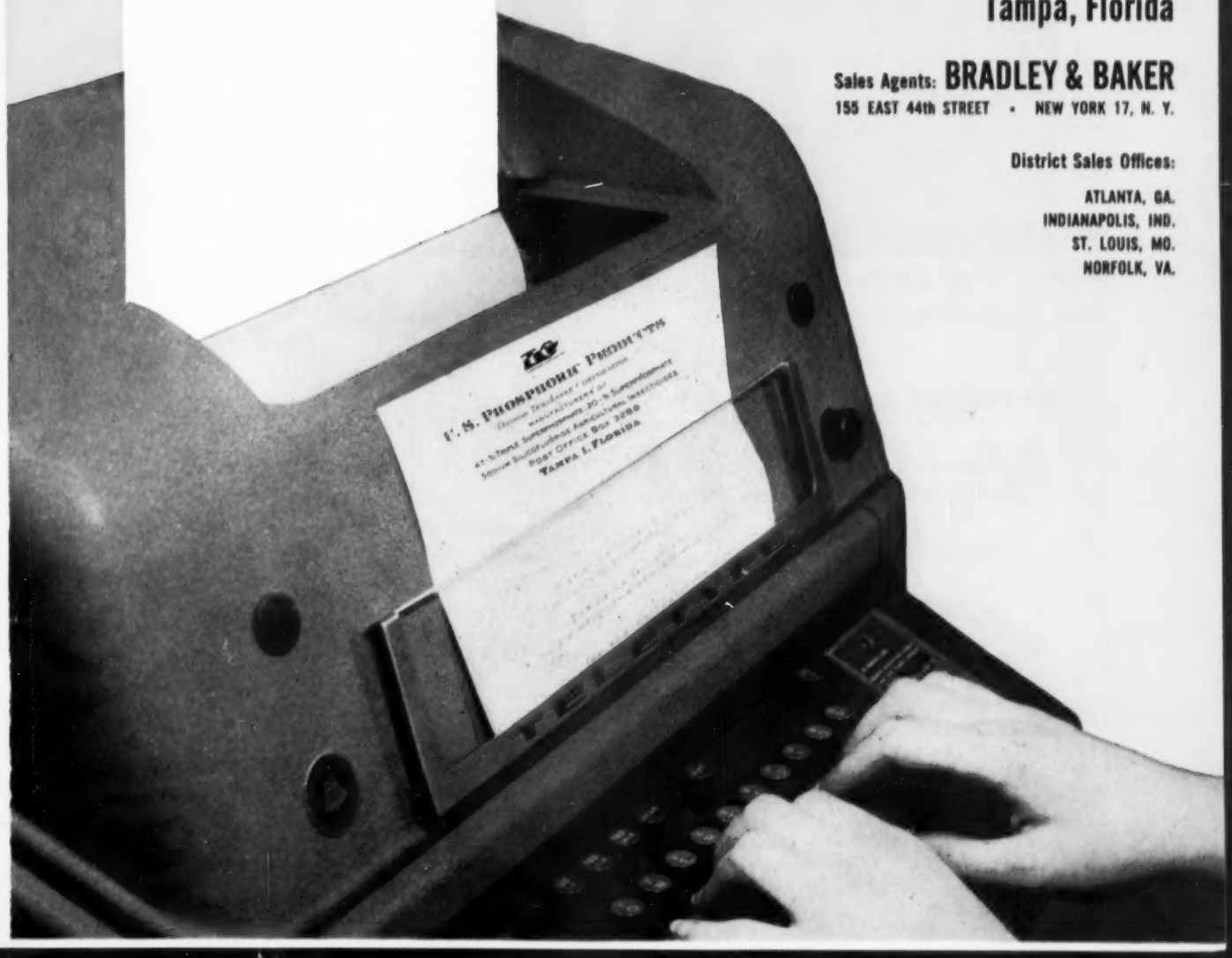
NORFOLK, VA.



TAILORED

to fit your product!

COMPLETE RANGE of Multiwalls, *custom-made* to satisfy the most exacting needs of every "bagable" product.

All types of paper from Albemarle's great mills, including asphalt laminated, creped, wet-strength, colored kraft and other specialties.

Multi-colored printing in perfect register.

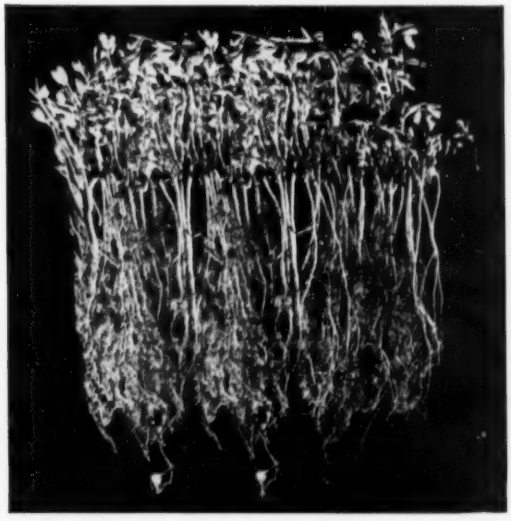
And always the assurance of quick delivery where, when and as often as needed.

RAYMOND BAG CORPORATION

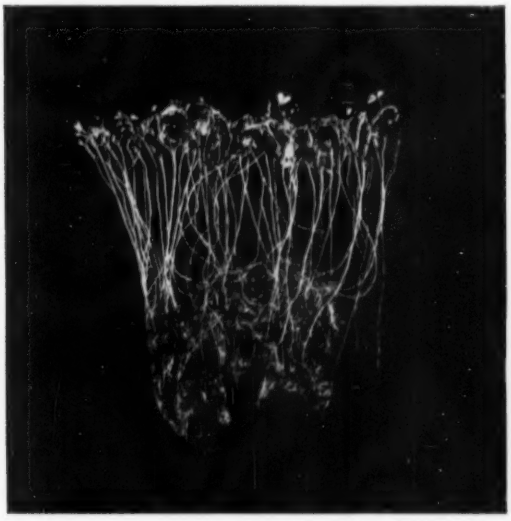
Albemarle Division of PAPER MFG. COMPANY
Middletown, Ohio • Richmond, Va.

Raymond
MULTIWALLS

IN ALFALFA, POTASH-ENRICHED FERTILIZERS MAKE THE DIFFERENCE



with sufficient potash



without sufficient potash

It pays the farmer to enrich his soil with balanced fertilizers—pays him with healthy, vigorous, profitable crops. Potash, an essential element in these balanced fertilizers, fortifies plants against disease and increases both yield and crop quality.

USP's high-grade muriate of potash has the highest K_2O content and is free-flowing and non-caking—important advantages in the production of the balanced fertilizers which help American farmers to better crops and better incomes.

HIGRADE MURIATE OF POTASH 62/63% K_2O
GRANULAR MURIATE OF POTASH 60% K_2O MIN.

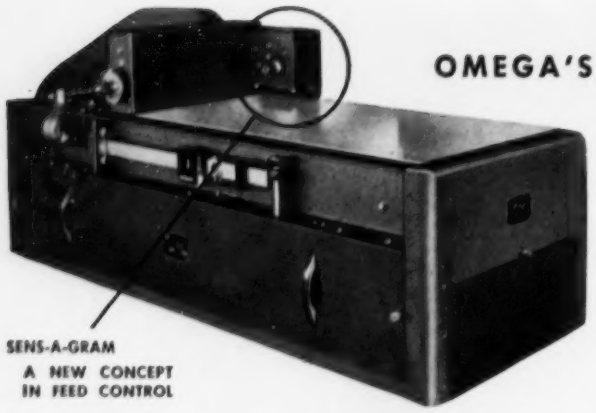
REG. U. S. PAT. OFF

UNITED STATES POTASH COMPANY

INCORPORATED

30 Rockefeller Plaza, New York 20, N. Y.

Southern Sales Office
Rhodes-Haverty Building, Atlanta, Georgia



SENS-A-GRAM
A NEW CONCEPT
IN FEED CONTROL

OMEGA'S

Hi-Weigh

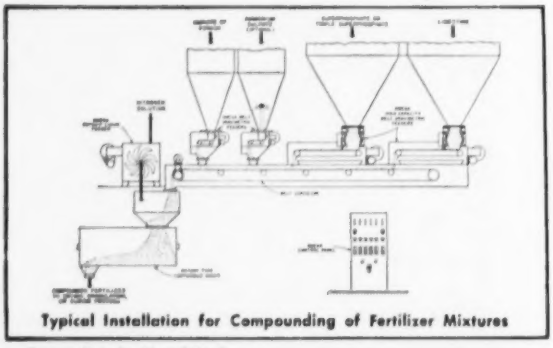
- **ACCURATE**
- **HIGH SPEED**
- **WEIGHING FEEDER**

for Batch or Continuous Formulating

The Model 37-20 *Hi-Weigh* is Omega's answer to industry's need for a medium to very high capacity dry materials feeder. It combines accuracy with ruggedness . . . and together with other B-I-F equipment, makes automation in this field a reality. This unit offers improved formulation accuracy, greater operating economies, and increased production. Request Bulletin 35-N16 for full details.

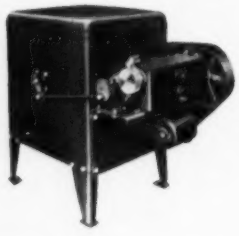
CHECK THESE FEATURES!

- **HIGH CAPACITY FEED RATE** . . . over 3000 lbs./min.
- **HIGH ACCURACY** . . . ± 1% by weight over full range.
- **WIDEST AVAILABLE RANGE** . . . Omega variable speed drive and extra large weight-sensing section provide almost limitless range of rates.
- **NO BELT SLIPPAGE/TRAINING** . . . eliminated by positive chain drive attached to heavy-duty belt.
- **RAPID RATE SETTING** . . . easily meets any formula changes.
- **SENS-A-GRAM CONTROLLER** . . . mechanically senses and corrects slightest weight deviation.
- **EASY RATE CHECKING** . . . built-in sampling gate is standard equipment.
- **NON-FLOOD ROTOR** . . . operates in proportion to feed rate.
- **HOPPER AGITATION** . . . varies with feed rate for maximum efficiency.
- **MINIMUM MAINTENANCE** . . . facilitated by superior design.



Typical Installation for Compounding of Fertilizer Mixtures

Omega Rotodip Liquid Feeder — in stainless steel construction — is the ideal means of feeding unrefined phosphoric acid in producing superphosphate. The Rotodip provides high repeat accuracy (within 1%) — wide feed range adjustability (100 to 1) — plus the important advantage of being very easy to clean due to the simple design of its flat-sided components. Maximum feed rate 1800 GPH. Write for Bulletin.



The Omega Model 50-8 Belt Gravimetric Feeder offers unusually high production (up to 3 cu. ft. per min. of material) . . . from minimum (only 6 sq. ft.) floor space. Rugged designs and safety features assure continuous service. Available in wide variety of hopper capacities and feeder sizes. This model offers high-efficiency operation . . . minimum downtime and maintenance . . . automatic control . . . and continuous or batch compounding through multi-unit installations.

Share in the wealth of design, manufacturing, and installation experience that B-I-F Industries, Inc. has to offer. Omega will be glad to send complete data and recommendations on your particular compounding, blending, or formulating problem . . . whether it involves a single feeder . . . or an entire system complete with high and low rate feeders, panels, and integrating controls. We are always glad to be of service . . . without any obligation on your part. Make your process more profitable . . . act today!

OMEGA MACHINE COMPANY
338 Harris Avenue Providence 1, Rhode Island

B-I-F

B-I-F INDUSTRIES

PROVIDENCE, RHODE ISLAND

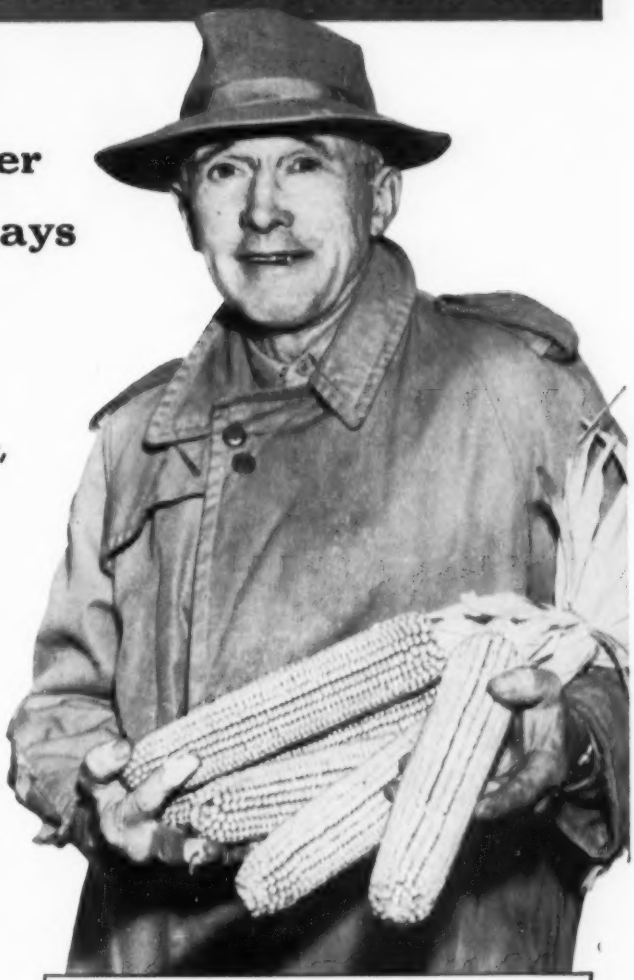
B-I-F METERS FEEDERS CONTROLS

OMEGA MACHINE CO. • PROPORTIONEERS, INC. • BUILDERS-PROVIDENCE, INC. • BUILDERS IRON FOUNDRY

HOW UNION BAG BUILDS MORE BUSINESS FOR THE FERTILIZER INDUSTRY

"I insist on fertilizer in Multiwall bags," says world champion corn grower

Willard C. Kirk, farmer, Jeffersonville, Ohio



"Science rules on my farm," says Mr. Kirk, winner of many "ten ears" awards and trophies. "I rotate strictly so as not to rob my soil—soybeans and oats, one year each; pasture, two years; then corn, one year. I use lots of fertilizer, and prefer it packed in 80-lb. Multiwalls. I find Multiwalls easy to handle and store, and to open and empty completely. Also, fertilizer does not sift out of these paper bags."

Union Bag fosters science on the farm

Many farmers, like Mr. Kirk, get tips on fertilizer use through the information program of Union Bag & Paper Corporation, which provides basic data for newspapers, magazines, and radio and television stations.

Union's country-wide educational program is designed to increase fertilizer consumption. More and more of the output of this growing industry is being marketed in Union Multiwall bags.

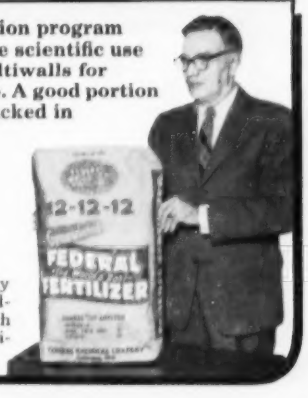
As farmer and dealer preference for fertilizer-in-multiwalls continues to grow, so does manufacturers' preference for Union Multiwalls.

Are you completely posted on all the recent advances in multiwall packaging of fertilizer? We will be glad to show you some of the new Union sacks the industry is now using so successfully.

"Union Bag's information program will help farmers in the scientific use of fertilizer. Union Multiwalls for fertilizer help them too. A good portion of our production is packed in Union Multiwalls."

Mr. John R. Sargent,
Vice President
in Charge of Sales,
Federal Chemical Company,
Louisville, Ky.

Federal Chemical Company supplies America's "bread-basket" with fertilizer, much of it packed in Union Multiwall bags.



UNION Multiwall Bags

TRADE MARK UNION

UNION BAG & PAPER CORPORATION · WOOLWORTH BUILDING, NEW YORK 7, N. Y.

NOW ON STREAM!

Escambia Bay Chemical Corporation, Pensacola, Florida — the only plant of its type on the Gulf Coast, east of New Orleans!

NOW PRODUCING A CONTINUOUS SUPPLY OF ANHYDROUS AMMONIA, NITRIC ACID, BAY-SOL NITROGEN SOLUTIONS, AND—

AMMO-NITE

AMMONIUM NITRATE FERTILIZER

Containing 33.5% Nitrogen

Sell AMMO-NITE . . . and you can offer your customers *more* Nitrogen for *less* money than other plant food forms. Simple arithmetic proves it! More Nitrogen in every bag means less bulk and weight for you and your customers. Uniform AMMO-NITE prills flow freely, spread evenly — never clog or stick in the spreader. AMMO-NITE leaches far less, too! New *stay-dry* bags keep AMMO-NITE in perfect condition in any weather. Order now. *It's a money-maker!*

GROW IT RIGHT WITH AMMO-NITE!

Products of the Escambia Bay Chemical Corporation, Pensacola, Florida, are distributed exclusively by

ASHCRAFT-WILKINSON COMPANY, Atlanta, Georgia

SALESMEN... to help boost YOUR profits!

LION Advertisements Sell LION Nitrogen, *and* Your Mixed Goods, Too!

Continuous Lion advertising appears in leading farm publications, month-after-month, to pre-sell the Lion brand to farmers—and to sell the value of *your mixed fertilizers as well!*

Current advertisements are appearing in Farm and Ranch-Southern Agriculturist, Progressive Farmer, The Farmer, Nebraska Farmer, Kansas Farmer, Prairie Farmer, Wallace's Farmer & Iowa Homestead, Wisconsin Agriculturist and Farmer, Missouri Ruralist and Missouri Farmer. All of these advertisements are in color.

Each Lion advertisement promotes the economic benefits of properly using fertilizers, including Lion Ammonium Nitrate, to help increase the farmer's profits. Each advertisement sells *hard* on the importance of soil tests in the intelligent use of all commercial fertilizers. Lion, a leader in nitrogen production, leads the way to good fertilization practices . . . to better profits for you!

LION'S QUALITY LINE OF NITROGEN FERTILIZER MATERIALS

LION ANHYDROUS AMMONIA—82.2% nitrogen. Quality guaranteed.
LION AQUA AMMONIA—Ammonia content above 30%—other grades to suit your requirements.
LION AMMONIUM NITRATE FERTILIZER—Improved spherical pellets. Guaranteed 33.5% nitrogen.
LION NITROGEN FERTILIZER SOLUTIONS—Various types to suit your particular manufacturing needs.
LION SULPHATE OF AMMONIA—White, uniform, free-flowing crystals. Guaranteed 21% nitrogen.

LION OIL COMPANY

A DIVISION OF MONSANTO CHEMICAL COMPANY

EL DORADO, ARKANSAS

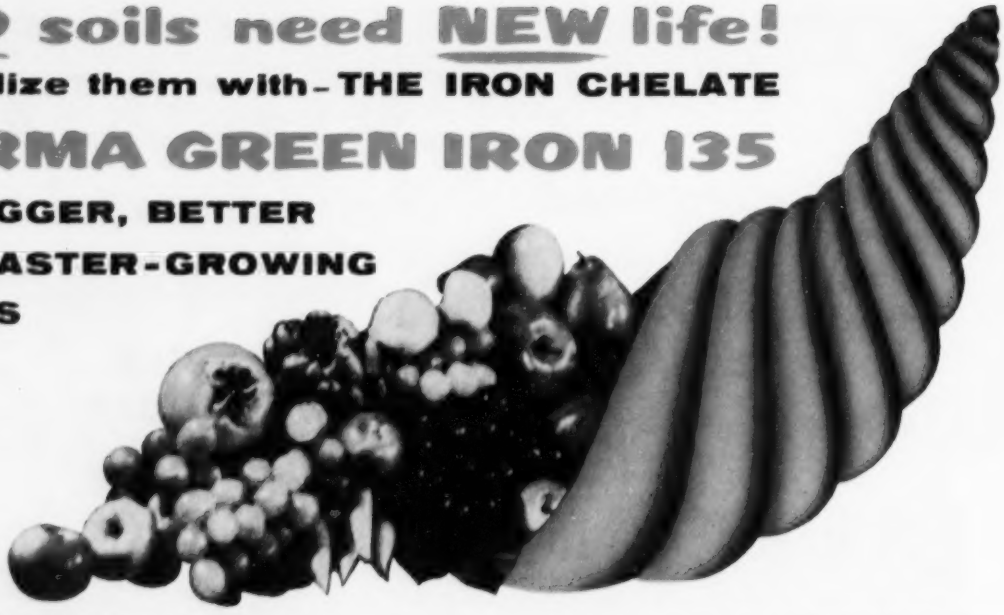
DISTRICT SALES OFFICES: Lion Oil Building, El Dorado, Ark. • Insurance Exchange Building, Des Moines, Ia. National Bank of Commerce Building, New Orleans, La. • 1401 Building, Atlanta, Ga.

OLD soils need NEW life!

revitalize them with – THE IRON CHELATE

PERMA GREEN IRON 135

for BIGGER, BETTER and FASTER-GROWING CROPS



UNTREATED

ORANGES

Four ounces to one pound PERMA GREEN IRON 135 per tree produces dark green leaves and more, larger and better colored oranges.

TREATED

When iron is lacking and plant leaves turn yellow, PERMA GREEN IRON 135 makes them dark green in two weeks' time.

PERMA GREEN IRON 135 is an organic chelate that moves upward with the sap to rejuvenate the entire plant.

PERMA GREEN IRON 135 *now produces –*

– healthier and more productive blueberry bushes
– larger and more beautiful roses
– deeper-green leaves on azaleas and rhododendrons
– more attractive ornamental trees and shrubs.
– more nutritious vegetables
– more and juicier oranges and grapefruit
– more and larger nuts

Write for detailed information on PERMA GREEN IRON 135 for plants and reprint of scientific article on its action.

Developed by RESEARCH • Proved by PERFORMANCE

for quality products, remember –

Refined PRODUCTS CORPORATION

Manufacturing Chemists • 632 Schuyler Ave. • Lyndhurst, N. J.

SUNFLOWERS

Grown in nutrient solution. Small yellow plant at left treated with iron sulphate. Large dark green plant at right treated with PERMA GREEN IRON 135.

GARDENIAS (Greenhouse)

Iron is very important for gardenias. Treat each bush with 1/16 to 1/8 level tablespoonful PERMA GREEN IRON 135 to insure dark green leaves and large pure white flowers.

TECHNICAL AND ECONOMIC FACTORS INVOLVED IN PRODUCTION OF FERTILIZERS OF HIGH WATER-SOLUBLE P_2O_5 CONTENT BY CONVENTIONAL PROCESSES

by
T. P. Hignett

Chief, Development Branch
Division of Chemical Development

Tennessee Valley Authority
Wilson Dam, Alabama

This study points up a challenge our industry must face. Some recent agronomic results have indicated sizeable increases in yields where fertilizers of high water-soluble phosphorus content were used for certain specific applications. It must eventually fall to us, the fertilizer industry, to produce these goods at the same price as conventional mixtures, or to sell the consumer on paying a premium for them.

—Editor

The effect of the water solubility of phosphorus in fertilizers has been a subject of many agronomic experiments. These experiments have shown that under some conditions the crop yield was increased by increasing the solubility of phosphorus in the fertilizer. Under some conditions the crop yield was increased by increasing the solubility of phosphorus in the fertilizer. Under some other conditions, corn yields were not affected by the water solubility of the phosphorus in the fertilizer.

It seems appropriate to examine the relative costs of producing fertilizers of various degrees of water solubility and to compare these costs with their relative value for crop production. Pesek's paper (4) has presented an economic interpretation of the importance of phosphorus solubility in fertilizers for certain specific uses. The present paper presents a comparison of the cost of producing certain grades of fertilizer by formulations that would provide different levels of water solubility ranging from about 20 to 80 per cent. The cost comparisons will be restricted to fertilizers produced in a typical manufacturing plant from conventional raw materials. The formulations used will be those that have been shown by experience to be suitable for production of fertilizers of satisfactory physical properties.

The term "water-soluble P_2O_5" as used in this paper refers to the amount of P_2O_5 dissolved in an A.O.A.C. (1) analytical procedure. In this procedure a 1-gram sample is placed on a filter paper and washed with successive small portions of water until 250 milliliters of filtrate are collected. Vacuum filtration is used, if necessary, to complete the washing in 1 hour. The term "water solubility" of the phosphorus content of fertilizers refers to the percentage of the available P_2O_5 content that is water soluble, as determined by A.O.A.C. procedures.

The A.O.A.C. water washing procedure originally was intended to remove the readily soluble phosphorus compounds from superphosphate in preparation for extraction with neutral ammonium citrate solution. No determination of the amount of phosphorus dissolved by the water washing procedure is required in the course of determining available P_2O_5, and such determinations are seldom made in commercial practice. However, the method seems fairly satisfactory for separating the readily soluble compounds, ammonium phosphates and monocalcium phosphate, from the relatively insoluble phosphorus compounds in most conventional fertilizers. The method should be re-examined if it is to be used for evaluation of the quality of commercial fertilizers.

At present, no guarantee of the water-soluble P_2O_5 content of fertilizers is required, and usually none is made. Most manufacturers do not determine the water-soluble P_2O_5 content of their products. In view of the importance of water solubility for some fertilization practices, it appears that some method of recognizing and reporting water solubility is needed.

Presented at Seminars for Cooperators in the TVA Agricultural Economics Research Activities at Knoxville, Tennessee, March 27-30, 1956

Most commercial fertilizers derive their prosphorus content from ordinary or triple superphosphate or mixtures of these materials. Ammoniation of the superphosphates is an almost universal step in producing grades containing both nitrogen and phosphorus. Ammoniation is an economical means of supplying nitrogen, and it is a necessary step in most granulation processes. In many cases it would be difficult to produce high-analysis grades of satisfactory physical properties from conventional raw materials without ammoniation.

Ammoniation of superphosphates results in a series of chemical reactions by which monocalcium phosphate is converted to ammonium phosphates which are water soluble and dicalcium phosphate and other more basic calcium phosphates which are water insoluble. Figure 1 shows the effect of the degree of ammoniation on the water solubility of P_2O_5 in ordinary superphosphate. These data were obtained in a TVA pilot-plant study of ammoniation of superphosphates as a step in the production of mixed fertilizers. The maximum practical degree of ammoniation in commercial processes is between 6 and 7 pounds of free ammonia per unit of P_2O_5 in ordinary superphosphate. This degree of ammoniation reduces the water solubility of the P_2O_5 to about 20 to 25 per cent. Since ammonia or ammoniating solutions are the cheapest forms of nitrogen available to fertilizer manufacturers, most manufacturers try to achieve a high degree of ammoniation when producing high-nitrogen grades.

Figure 2 shows the effect of the degree of ammoniation on the water solubility of P_2O_5 in triple superphosphate. The minimum water solubility obtained was about 50 per cent at 2.5 to 3.8 pounds of free ammonia per unit of P_2O_5. Higher degrees of ammoniation tended to increase the water solubility because some of the dicalcium phosphate reacted with ammonia to

Table I: Formulations and Costs for 3-12-12

Raw material	Grade	Price, $/ton	23% of P_2O_5 in a water-soluble form		65% of P_2O_5 in a water-soluble form	
			Lb./ton	$/ton	Lb./ton	$/ton
Ordinary superphosphate	20% P_2O_5	20.00	1224	12.24	1224	12.24
Ammonia	82% N	90.00	75	3.38	...	...
N solution X	40.8% N	57.00	...	...	150	4.28
Potassium chloride	60% K_2O	34.00	408	6.94	408	6.94
Filler	.....	4.00	293	0.59	218	0.44
			2000	23.15	2000	23.90
Operating cost and overhead				7.70		7.70
Bags				3.00		3.00
				33.85		34.60
Sales cost (10 cents/unit)				2.70		2.70
				36.55		37.30
Freight (100 mi.)				4.00		4.00
Delivered cost				40.55		41.30
Delivered cost per unit				(1.50)		(1.53)
Price to dealer				46.00		46.00
Profit*				5.45		4.70

*Before corporation income taxes.

Table II: Formulations and Costs for 5-20-20

Raw material	Grade	Price, $/ton	50% of P_2O_5 in a water-soluble form		75% of P_2O_5 in a water-soluble form	
			Lb./ton	$/ton	Lb./ton	$/ton
Ordinary superphosphate	20% P_2O_5	20.00	297	2.97	192	1.92
Triple superphosphate	46% P_2O_5	58.00	758	21.98	803	23.29
Ammonia	82% N	90.00	125	5.63	...	...
N solution Y	40.8% N	57.00	...	...	250	7.13
Sulfuric acid	66° Be.	20.00	140	1.40	140	1.40
Potassium chloride	60% K_2O	34.00	680	11.56	680	11.56
			2000	43.54	2055	45.30
Operating cost and overhead				7.70		7.70
Bags				3.00		3.00
				54.24		56.00
Sales cost (10 cents/unit)				4.50		4.50
				58.74		60.50
Freight (100 mi.)				4.00		4.00
Delivered cost				62.74		64.50
Delivered cost per unit				(1.39)		(1.43)
Price to dealer				71.00		71.00
Profit*				8.26		6.50

*Before corporation income taxes.

produce tricalcium phosphate or hydroxyapatite and diammonium phosphate.

The data of Figure 2 are for ammoniation of straight triple superphosphate with anhydrous ammonia. Several tests were made in which a 10-20-20 fertilizer was made by ammoniation of mixtures of triple superphosphate, potassium chloride, and sulfuric acid with ammonia-ammonium nitrate solutions. The degree of ammoniation varied from 3.5 to 4.3, and the water solubilities varied between 60 and 70 per cent; these solubilities are somewhat higher than the curve in Figure 2. The reason for this difference is not known.

The water solubility of P_2O_5 in mixed fertilizers may be decreased by inclusion of basic materials other than ammonia. Limestone, dolomite, and calcium cyanamide are examples of basic materials that may be added to mixed fertilizers which may decrease the water solubility.

Fertilizers in which the water solubility of the P_2O_5 content is less than 20 per cent may be made by heavy ammoniation of superphosphate plus the addition of limestone or other basic materials.

A survey of the water solubility of phosphorus in mixed fertilizers in 1949-1950 was reported by K. G. Clark and W. M. Hoffman (2). The water solubility of mixed fertilizers varied from 3 to 100 per cent and averaged about 50 per cent.

Formulations and Costs for 1-4-4 Fertilizers

Formulations and costs for typical mixed fertilizers were calculated using raw materials costs that are believed to be typical of a midwestern location. The most common 1-4-4 ratio grades are 3-12-12 and 5-20-20. Two formulations for 3-12-12 are shown in Table I. One formulation uses anhydrous ammonia for ammoniation; the other uses a typical ammoniation solution containing 21.7 per cent free ammonia, 65 per cent ammonium nitrate, and 13.3 per cent water. When anhydrous ammonia is used, the degree of ammoniation is about 6.2 pounds of free ammonia per unit of P_2O_5 and the resulting water solubility of the phosphorus content is about 23 per cent (see Fig. 1). When the ammoniating solution containing 21.7 per cent free ammonia is used, the degree of ammoniation is 2.7 and the water solubility is 65 per cent. The difference in cost between these two formulations is only $0.75 per ton which is less than 2 per cent of the price to dealers. However, this cost difference is equivalent to 14 per cent of the manufacturer's profit.

If limestone is used as filler, the water solubility might be decreased below 20 per cent. The effect on cost would depend on the relative cost of limestone and other filler materials.

Formulations and costs for 5-20-20 are shown in Table II. This grade is one that is usually produced in granular form. The formulations shown are known to be satisfactory for granulation by commonly used processes. The formulation that uses anhydrous ammonia is the cheaper and the more satisfactory for granulation. The degree of ammoniation is 3.9, and the water solubility of the P_2O_5 content is about 50 per cent, as determined experimentally (3). In the formulation that uses an ammoniating solution containing 26 per cent free ammonia, the degree of ammoniation is about 1.0 and the water solubility is about 75 per cent. Use of an ammoniating solution containing only 21.7 per cent ammonia in this formulation would decrease the degree of ammoniation to about 0.5 and would increase the water solubility to about 85 per cent (Fig. 2); the cost would not

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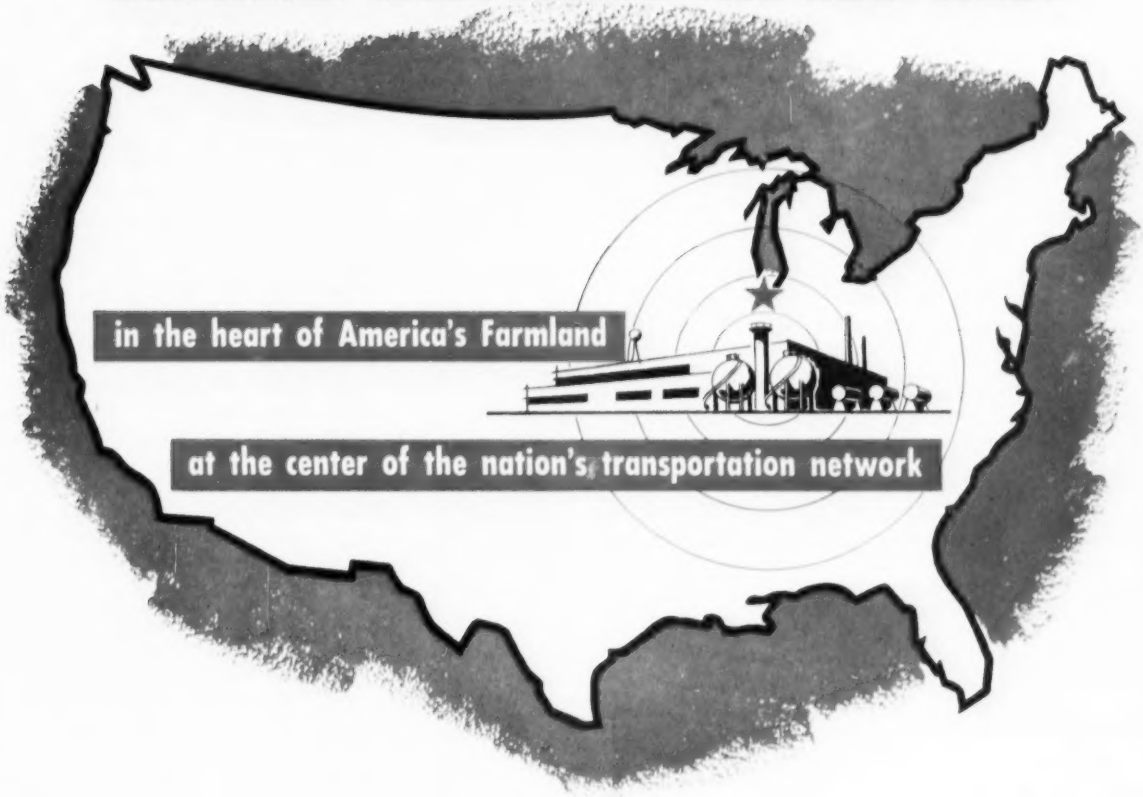

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Table III: Formulations and Costs for 10-10-10

Raw material	Grade	Price, $/ton	23% of P_2O_5 in a water-soluble form		40% of P_2O_5 in a water-soluble form	
			Lb./ton	$/ton	Lb./ton	$/ton
Ordinary superphosphate	20% P_2O_5	20.00	1020	10.20	1020	10.20
N solution X	40.8% N	57.00	500	14.25	397	11.31
Ammonium sulfate	21% N	48.00	—	—	200	4.80
Sulfuric acid	—	20.00	120	1.20	120	1.20
Potassium chloride	60% K_2O	34.00	340	5.78	340	5.78
Filler	—	4.00	100	0.20	—	—
			2800	31.63	2077	33.29
Operating cost and overhead				7.70		7.70
Bags				3.00		3.00
				42.33		43.99
Sales cost (10 cents/unit)				3.00		3.00
				45.33		46.99
Freight (100 mi.)				4.00		4.00
Delivered cost				49.33		50.99
Delivered cost per unit				(1.64)		(1.70)
Price to dealer				60.30		60.30
Profit*				10.97		9.31

*Before corporation income taxes.

Table IV: Formulations and Costs for 12-12-12

Raw material	Grade	Price, $/ton	50% of P_2O_5 in a water-soluble form		75% of P_2O_5 in a water-soluble form	
			Lb./ton	$/ton	Lb./ton	$/ton
Ordinary superphosphate	20% P_2O_5	20.00	513	5.13	147	1.47
Triple superphosphate	46% P_2O_5	58.00	311	9.02	467	13.54
N solution X	40.8% N	57.00	500	14.25	308	8.78
Ammonium sulfate	21% N	48.00	200	4.80	567	13.61
Sulfuric acid	66° Be.	20.00	150	1.50	150	1.50
Potassium chloride	60% K_2O	34.00	406	6.90	406	6.90
			2080	41.60	2045	45.80
Operating cost and overhead				7.70		7.70
Bags				3.00		3.00
				52.30		56.50
Sales cost (10 cents/unit)				3.60		3.60
				55.90		60.10
Freight (100 mi.)				4.00		4.00
Delivered cost				59.90		64.10
Delivered cost per unit				(1.66)		(1.78)
Price to dealer				73.70		73.70
Profit*				13.80		9.60

*Before corporation income taxes.

be affected appreciably. The difference in cost between the two formulations shown in Table II is $1.76 per ton, or about 2.5 per cent of the price to dealers. However, this difference is equivalent to 21 per cent of the manufacturer's profit.

Comparison of Tables I and II shows that the most economical way to increase the water solubility of a 1-4-4 ratio fertilizer is to increase the grade. Comparison of the more economical formulations for 3-12-12 and 5-20-20 shows that the delivered cost for 5-20-20 is less per unit of plant food ($1.39 vs. $1.50/unit) and that the water solubility is higher (50 vs. 23%).

Formulations and Cost for 1-1-1 Ratio Fertilizers

Two important grades of 1-1-1 ratios are 10-10-10 and 12-12-12. These grades are often produced as granular fertilizers; the formulations considered are suitable for granulation.

Two formulations for 10-10-10 are shown in Table III. Ordinary superphosphate is the only source of P_2O_5 in both formulations. In the first case, all of the nitrogen is supplied from ammoniating solution; the degree of ammoniation is about as high as is practical (6.8), and the water solubility is about 23 per cent (3). In the second formulation the degree of ammoniation is decreased to 4.8 by deriving some of the nitrogen from ammonium sulfate and thereby decreasing the amount of ammoniating solution. The water solubility of the P_2O_5 content is about 40 per cent (Fig. 1). The product of lower solubility costs $1.66 per ton less. Producing

(*Continued on page 67*)

Figure 1. Effect of Degree of Ammoniation on Water Solubility of P_2O_5 in Ordinary Superphosphate.

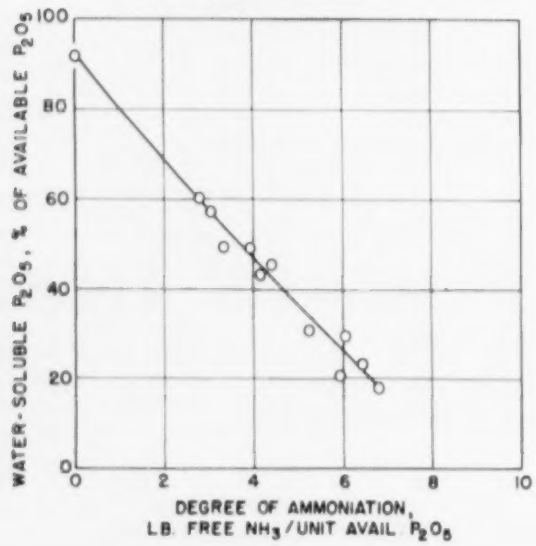
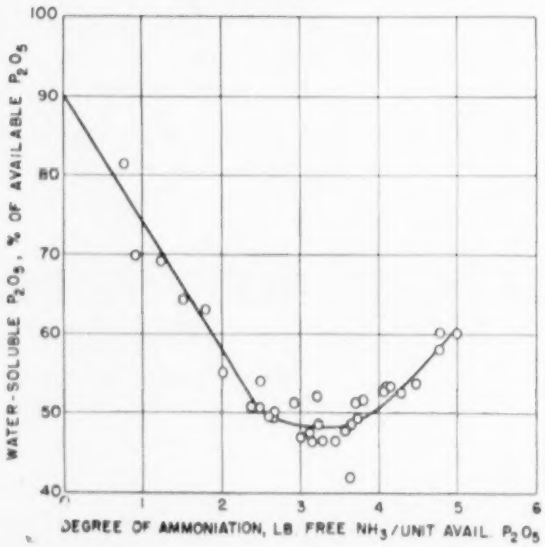


Figure. 2. Effect of Degree of Ammoniation on Water Solubility of P_2O_5 in Concentrated Superphosphate.



INSECTICIDE-FERTILIZER MIXTURES—TWO PAPERS ON THIS SUBJECT—AS PRESENTED AT MID-WEST SOILS MEET

The Value of Insecticide-Fertilizer Mixtures

J. W. Apple
University of Wisconsin

Authorities tell us that pesticides (insecticides-95% and herbicides and others-5%) were incorporated into 200,000 tons of commercially prepared fertilizer in 1955. Last year's consumption shows a 34 per cent increase over the 149,100 tons purchased in 1954 in spite of the fact that tonnage of all fertilizers dropped off 1.52 per cent. The southeastern part of the country was the first to use such mixtures to provide plant nutrients and obtain insect control. According to Farrar (1953) of the South Carolina Station, the following insects are controlled in this area with insecticides in fertilizer: corn rootworm in corn and peanuts, green June beetle in pastures, white fringed beetles and wireworms in miscellaneous crop lands. Sixty-nine per cent of all pesticide-fertilizer mixtures was sold in the South Atlantic States during 1953. Consumption in this area increased significantly during 1954 while a remarkable increase in demand appeared in the Corn Belt. The Middle West used 4,500 tons or 5.2 per cent of such specialty mixtures in 1953 while in 1954 some 49,300 tons or 33 per cent of the total was used in the Corn Belt. Regional consumption of the 200,000 tons sold in 1955 is not yet available but when this information is published, I suspect we'll find the North Central area used close to one half of all pesticide-fertilizer mixtures.

Prior to 1953 a few midwestern maufacturers incorporated insecticides into plant food by spraying a solution of the chemical over the fertilizer but the industry as a whole avoided this new process because there were no suitable formulations for easy mixing. Dust concentrates could be used but were too disagreeable to handle. Insecticides on a granulated clay carrier as proposed by Farrar in 1923 offered a solution to this problem and as a result we saw the first major midwestern effort to incorporate an insecticide (aldrin) into fertilizers during 1923. This practice caught on rapidly and accounts for the increase from 4,500 to 49,300 tons of pesticide-fertilizer mixtures purchased in the Corn Belt from 1953 to 1954. It is interesting to note that the fertilizer industry is now swinging to the use of insecticides in solution for treating the new granulated fertilizer and just four years ago this method was disregarded by the majority.

Most of you are aware of the insects which had a part in this phenomenal interest in insecticide-fertilizer mixtures in the North Central Region. The corn rootworm, Diabrotica longicornis, and the western corn rootworm Diabrotica virgifera, are the corn pests which have become by-words with fertilizer people. Early work on these pests in Nebraska and Iowa showed that insecticides such as benzene hexachloride, chlordane, aldrin and heptachlor provided a high degree of control when distributed evenly over the surface of infected soil before plowing or final soil preparation. No research work had been done on the incorporation of such chemicals into starter-fertilizer for rootworm control until the work of Cox and Lilly (1953) in 1951. In spite of favorable results in this first study, there was a general neglect of research work on this method in favor of broadcast sprays until 1953 when granulated insecticides became available to the fertilizer industry.

Midwestern farmers are now using insecticide-fertilizer mixtures on approximately one million acres of corn as a result of a few research and demonstrational plots and a very intensive promotional program on the part of extension entomologists and commercial concerns. However, it is the opinion of some that usage has outdistanced research findings and it is only proper at this time that we pause and take stock of the information on subterranean insect control with poisons incorporated in fertilizers.

Corn rootworms — Cox and Lilly (1953) found that insecticides in starter-fertilizer provided a high degree of control for the corn rootworm in 1951. They used wettable powders of aldrin, chlordane and dieldrin in starter-fertilizer to provide one pound of each chemical per acre. On the average, these chemicals reduced rootworms 87 per cent and increased yields 28 per cent in a field having 18 worms per hill. Lilly (1954) used insecticides on clay granules in starter-fertilizer during 1953 in a second Iowa test and obtained only 68 to 76 per cent reduction of rootworms and no significant yield increases with dosages of 0.8 lb. chlordane, 0.6 lb. aldrin and 0.5 lb. heptachlor per acre. Even though there were 20 rootworms per hill in the untreated rows of this field, there was no evidence of lodging. A more common reaction to rootworms is to have noticeable lodging but no serious loss in yield at least when measured by hand harvested samples.

In Kansas during 1953, C. C. Burkhardt (1954) obtained limited response to insecticides in fertilizers used against the western corn rootworm. Wettable powders were mixed into starter-fertilizer to provide 0.25 and 0.50 pound of heptachlor, aldrin and lindane and 0.5 and 1.0 pound of chlordane per acre. Lodging was reduced from 47 per cent in the control to 9 per cent or less by the insecticidal treatments. Heptachlor, chlordane and lindane reduced the worms 90 per cent or more while aldrin gave an average control of 63 per cent. Little or no yield benefits were demonstrated.

Experiments were conducted in Wisconsin during 1955 to determine the value of insecticide-fertilizer mixtures against the corn rootworm with special emphasis on testing reduced dosages of insecticides in starter-fertilizer. Two tests were conducted in southern Wisconsin on

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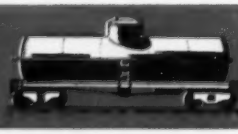

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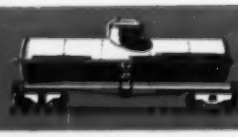

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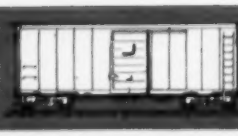

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fields which were in their fourth year of corn. Attapulgite granules impregnated with high dosages of several insecticides were mixed with common starter-fertilizers (5-20-20 and 4-16-16) to provide concentrations ranging from one-fourth to one pound of insecticide per acre. The latter rate is the recommended dosage for broadcast applications of aldrin and heptachlor while one-half this rate is commonly recommended for starter-fertilizer applications. Results based on plant lodging (over 45°) and yield in bushels of number two corn per acre are presented in Table 1.

Table 1. Plant response to insecticides in starter fertilizer used against corn rootworm. 1955 Experiments.

Insecticide per acre	Test 1 Per Cent lodging	[1]	Yield Bu./acre	Insecticide per acre	Test 2 Per Cent lodging	[1]	Yield Bu./acre
Heptachlor				Heptachlor			
.25	10.6		104.0	.22	3.1		88.2
.50	3.3		110.5	.44	2.6		89.0
Aldrin				Aldrin			
.25	9.9		93.0	.22	5.1		85.2
.50	11.8		104.5	.44	7.9		86.7
1.00	8.6		107.0	.87	11.6		79.0
Chlordane							
1.00	7.9		106.6				
Fertilizer alone	30.0		71.3	Fertilizer alone	40.5		78.5
L.S.D. 5%			12.8				N.S.

[1] Numbers associated with particular line are not significantly different at 5% level.

These rootworm data show that the generally accepted dosage of one-half pound per acre of aldrin or heptachlor in starter-fertilizer provided a high degree of plant protection. Aldrin at dosages of 0.44 and 0.5 pound per acre reduced lodging 70.5 per cent and increased yield 28.4 per cent while equal dosages of heptachlor reduced lodging 91.3 per cent and increased yield 34.1 per cent on the average. At rates of 0.22 and 0.25 pound per acre, heptachlor demonstrated an efficiency approximately equal to the half pound rate while aldrin showed a noticeable loss in effectiveness, especially in terms of yield.

The high concentration of aldrin in both tests were proprietary products formulated by fertilizer companies. There is no explanation why the 0.87 pound dosage of aldrin in test 2 gave such disappointing results but it does focus our attention on the inadequacy of this method of depositing insecticides unless formulation is correct and insecticidal activity is maintained.

Wireworms—The control of wireworms ranks second to rootworm control in the use of insecticide-fertilizer mixtures in the midwest. Unlike rootworms, the various species of wireworms are to be found on a great variety of host plants. Practically all corn fields have a few wireworms (less than one per square foot) and occasionally fields are encountered where these insects number five to twenty per square foot and crop damage is extensive. In addition to corn, we find wireworms attacking small grains, potatoes, lima beans and many of the other small acreage crops. Muck soils are frequently heavily infected with these pests as is our Spencer silt loam in central Wisconsin.

Information on the value of insecticide-fertilizer mixtures for wireworm control is even more limited than rootworm control data. The explanation for this lies in the fact that entomologists are prone to use sprays and dusts for broadcast application to the soil because this procedure resembles the usual approach taken to control insects on the foliage.

Kulash and Monroe (1955) of the North Carolina Station recently published a study where they compared several chemicals in fertilizer placed directly in the seed furrow, as broadcast applications of dust or granules and as seed treatments for the control of wireworms attacking corn in muck soil. The principle wireworm in these trials was melanotus communis which is one of the common species in midwestern corn fields. In a very severe test in 1952, they found the following corn stands remaining after six weeks; insectice-fertilizer in row—37.5%, broadcast application of similar dosages—25%, seed treatments 17.5% and untreated—8.7%. In this rather comprehensive test they rated the common soil insecticides in the following order of effectiveness — dieldrin = heptachlor ▶ aldrin.

At the Wisconsin Station, an evaluation of insecticides in starter-fertilizer was carried out against a Limonius wireworm attacking lima beans. The wireworm population averaged ¾ of a worm per foot of row and caused a 50.5 per cent stand reduction. The most heavily infested areas of the field were completely denuded by the insects.

Granulated formulations of aldrin, heptachlor, chlordane and dieldrin were mixed into 4-16-16 starter-fertilizer that was to be used in a conventional corn planter for seeding lima beans. While one or more pounds of insecticide per acre are recommended for band treatments to control wireworms, dosages below this rate were used in an attempt to bring out small differences between chemicals. The response to these mixtures was measured in terms of surviving plants and a summary of these data will be found in Table 2.

Table 2. Surviving plant count following use of insecticides in starter-fertilizer for wireworm control on lima beans.

Insecticide per acre	Plants per 25 foot of row	[1]	Percentage increase over control
2.0 lbs. aldrin	35.1		145
2.0 lbs. chlordane	32.1		124
1.0 lb. aldrin	31.5		120
0.5 lb. aldrin	30.6		114
0.5 lb. heptachlor	30.4		112
0.5 lb. dieldrin	20.3		42
Fertilizer alone	14.3		—
L.S.D. 5%	3.2		

[1] Numbers associated with particular line are not significantly different at 5% level.

Plant stands improved as the dosage of aldrin was increased from 0.5 to 2.0 pounds per acre although the lowest dosage more than doubled the number of plants found in untreated rows. A comparable dosage (0.5 lb.) of heptachlor gave similar results while dieldrin at this rate was significantly poorer than aldrin. Chlordane which is commonly used at a higher rate than aldrin or heptachlor, produced about the same results as aldrin when compared at a dosage of two pounds per acre.

Spencer silt loam soil of central Wisconsin carries a relatively high infestation of the wheat wireworm, Agriotes mancus, and farmers in that area are well aware of the damage caused to corn and oats. While most of the studies on the control of this wireworm species have centered around seed treatments, two tests with insecticides in the soil were conducted on oats by E. M. Raffensperger and serve to show the protection afforded by these chemicals. A 1954 test involved the incorporation of granulated aldrin in 0-20-20 fertilizer which was distributed at the time of seeding with a grain drill. Aldrin dosages of one and two pounds to the acre reduced wireworm-killed plants from 24.4 in the control to 6.7 and 6.0 per 50 feet of row, respectively.

During 1955, a comparable test was conducted on oats to evaluate aldrin and heptachlor in a wide range of dosages. In this experiment, 20 per cent aldrin and 25 per cent heptachlor on 30/60 mesh clay granules were distributed broadcast and worked in with a spring-toothed harrow. Fertilizer was not involved but the insecticides were in a form commonly used in fertilizer mixtures. A summary of the results in terms of wireworm-killed plants is shown in Table 3.

Table 3. Dead plant counts in experiment to evaluate granulated insecticides on wireworms attacking oats.

Insecticide	Dosage per acre ½ lb.	1 lb.	2 lbs.	3 lbs.
	Wireworm-killed plants/50 feet of row			
Heptachlor	5.0*	4.5*	0.0	0.2
Aldrin	30.0	25.8	5.2	2.5
None	86.5 (14% loss)			

* Heptachlor treatments significantly better than corresponding aldrin treatments.

Both heptachlor and aldrin showed a high degree of protection when used at two pounds per acre which is a commonly recommended rate in starter-fertilizer applications for oats. However, at reduced dosages heptachlor demonstrated a marked superiority over aldrin even at a dosage as low as one-half pound per acre. Yield samples were taken in this experiment but none of the treated plots showed a significant gain over the control. This response is quite typical in oats unless wireworm-killed plants amount to 50 per cent or more of the stand.

Soil insect complex—The latest innovation in the control of soil insects is to use an insecticide in corn soil regardless of previous cropping or known insect populations. Entomologists here in Illinois have become strong advocates of this practice after three years of intensive study. However, information to date is based for the most part on broadcast sprays and might apply to broadcasting of insecticide-fertilizer mixtures but much additional information is needed on the value of insecticides in starter-fertilizer. Bigger and Blanchard (1955) made six comparisons of insecticides in starter-fertilizer versus insecticides sprayed broadcast for the control of various insects in corn soil. The broadcast treatments resulted in an average stand increase of 432 plants per acre while insecticide in starter-fertilizer caused an increase of 280 plants per acre. For this particular comparison, no information was provided on the chemicals or dosage rates employed. The authors indicated a depressing effect of starter-fertilizer in contact with the corn seed. Their overall study during 1953 and 1954 showed that one to 1.5 pounds per acre of aldrin or heptachlor distributed broadcast gave an average stand increase of 849 (7.5%) plants per acre and an average yield increase of 6.9 bushels per acre when harvested with mechanical pickers. They found aldrin and heptachlor to be equally effective. The Illinois Station now recommends 1.5 pounds per acre of aldrin or heptachlor for broadcast treatments and one pound per acre for row treatments for the control of a soil insect complex in corn land.

The ultimate use of insecticides in fertilizers is governed only by the total sale of all fertilizers. This statement may seem somewhat presumptuous at this time but investigators are finding an ever increasing need for the elimination of soil insects and fertilizers whether spread broadcast or used as a starter provide an excellent carrier for our insect poisons. In addition, future research may show that chemicals in fertilizer may provide a means of controlling nematodes, which are old but grossly underrated plant pests.

LITERATURE CITED

Cox, H. C. and J. H. Lilly, Chemical control of the corn rootworm, Jour. Econ. Ent. 46: 217-224, 1953.

Bigger, J. H. and R. A. Blanchard, Ecology and control of soil insects attacking corn in Illinois. Jour. Econ. Ent. 48: 255-260, 1955.

Burkhardt, C. C., Chemical control of the western corn rootworm in Kansas in 1953. Jour. Econ. Ent. 47: 691-696, 1954.

Farrar, M. D., The granulated type of insecticide for soil treatment. Jour. Econ. Ent. 46: 377-379, 1953.

Kulash, W. M. and R. J. Monroe, Field tests for control of wireworms attacking corn. Jour. Econ. Ent. 48: 11-19, 1955.

Lilly, J. H., Insecticidal control of the corn rootworm. Jour. Econ. Ent. 47: 651-658, 1954.

Improved Methods of Insecticide Application to Fertilizers

Victor C. Smith
Velsicol Chemical Corporation

NEW METHODS

The addition of insecticide to commercial fertilizers has been carried out in three principle ways: insecticide dusts, granular insecticides and oil concentrates. Insecticides are also being added to liquid fertilizers and to liquid nitrogen solutions.

The Velsicol Chemical Corporation, working with technical heptachlor, has developed several new methods and improvements for adding insecticide to fertilizer.

DRY CONCENTRATE—40% STICKER CONCENTRATE

A heptachlor sticker concentrate, designed for incorporating heptachlor into dry fertilizers, is now available. This free-flowing material contains 40% actual heptachlor and is made by careful impregnation of the insecticide on commonly used fertilizer conditioning agents, such as celite and vermiculite. The application of the sticker concentrate to fertilizer can be adapted to any location in the plant where insecticide is now applied.

Advantages of the Sticker Concentrate

The heptachlor sticker concentrate is a dry, very uniformly impregnated material which is saturated to the point where it becomes a cohesive nondustable material and has the following advantages over other formulations designed to incorporate insecticide into fertilizer:

1. Less expensive than oil concentrates because of the use of less costly diluents and bags instead of drums.
2. Anticaking properties, provided for the fertilizer by the

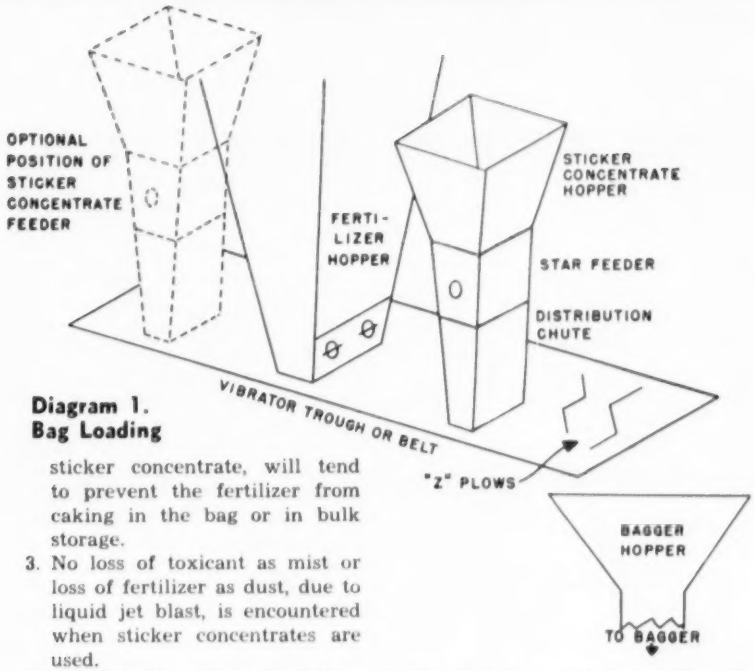


Diagram 1. Bag Loading

sticker concentrate, will tend to prevent the fertilizer from caking in the bag or in bulk storage.

3. No loss of toxicant as mist or loss of fertilizer as dust, due to liquid jet blast, is encountered when sticker concentrates are used.
4. No objectionable odor due to liquid insecticides or solvents are found in the process.
5. No insecticide vapors or solvent fire hazard can possibly be present with the use of the sticker concentrate.
6. Material handling is simplified by stacking light bags instead of heavy drums. No drum disposal problem is encountered.
7. No problem of cold stability with sticker concentrate, and warm storage is not necessary.
8. Uniformity of insecticide distribution in fertilizer is dependable through use of sticker concentrate, and particularly reproducible when a star feeder is used.

Methods of Application

Diagram No. 1 shows how a star feeder can be installed at typical loading operations.

Bulk Loading

In bulk loading operations where a guarantee of the degree of insecticide distribution is badly needed, the application of heptachlor sticker concentrate results in effective and reproducible distribution of the insecticide. This concentrate can be added in a bulk loading operation in any way granular or dust concentrates are now added, but the installation of a star feeder provides assurance that the right amount of insecticide will invariably be added, and also, eliminates mistakes attributable to the human element at this highly repetitive task.

A star feeder is equipped with an activating time release lever, which is tripped by the downward motion of the pay loader scoop and timed to feed the sticker concentrate into the conveyor during the time the fertilizer is emptying from the scoop. At the end of the unloading period, the time release disengages the activating lever to stop the flow of sticker concentrate. The star feeder, equipped with a deep rotor, is set to deliver the correct amount of sticker concentrate over the discharge period by adjustment of the variable-speed drive.

Bag Loading

A star feeder with an extended hopper, hopper agitator, adapter chute, medium rotor and a variable speed drive is installed to add the sticker concentrate to a belt or vibrator trough in a bag loading operation. The star feeder should be installed so the sticker concentrate can be added as close to the belt or trough as possible, either in front or in back of the location where the fertilizer is fed onto the conveyor. As the fertilizer and insecticide move down the conveyor, they are further mixed by flowing over "Z"-shaped plows.

This sticker concentrate can be applied to fertilizer in a bag loading operation at any percentage concentration in the range ½ to 2%, at any rate the fertilizer customarily flows (800-1600 lbs. per minute) and held to very close tolerances during this application. The power source of the star feeder is energized by the conveyor operating solenoid so that the sticker concentrate flows only when the fertilizer flows.

Equipment

Star Feeder: Omega Rotolock Model RL-6, complete with hopper, hopper agitator, variable speed drive and deep rotor for bulk loading or medium rotor for bag loading; B.I.F. Industries; Providence, R. I., or equivalent.

Hopper Extension and feeder Delivery Chute: fabricate on site to meet installation demands.

Activating Mechanism: activate from belt or conveyor solenoid in bag loading operations, and install a time release relay and activating lever for bulk loading operation.

Distribution of Sticker Concentrate in Fertilizers

The sticker concentrate is ideal for fertilizers because it flows readily through the fertilizers, coheres tenaciously, and has a low saturation maximum (around 3% insecticide) which prevents high percentages of insecticide adhering to certain portions of the fertilizer.

Significant stratification, as found in some granular insecticides, does not occur, and better distribution is effected because of the greater number of particles of insecticide per pound in the sticker concentrate than is found with the same weight of granular insecticide.

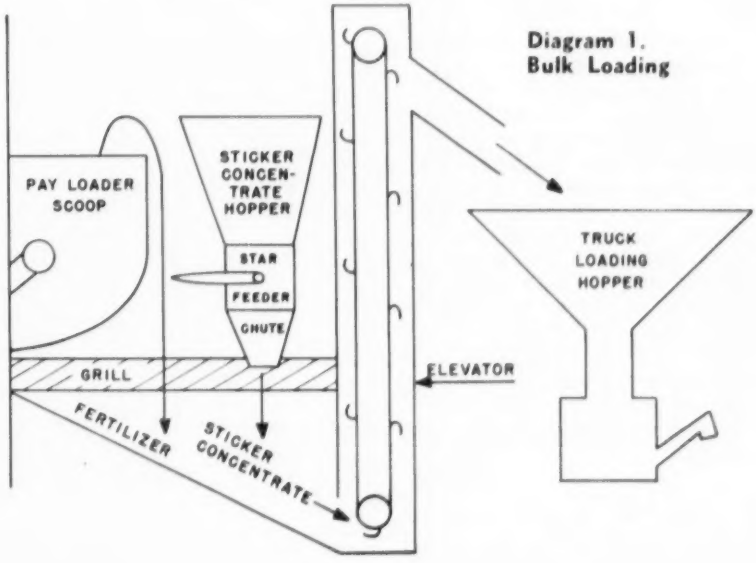
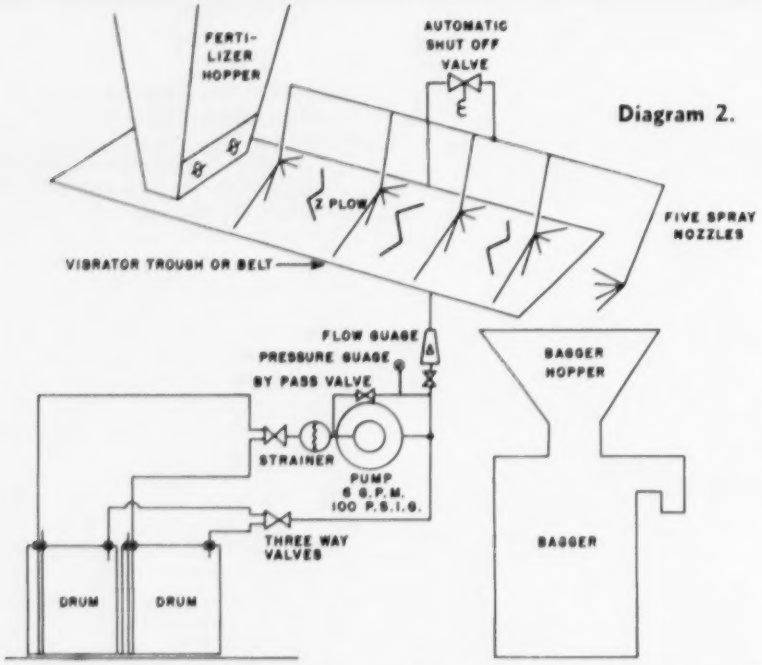


Diagram 1. Bulk Loading



DRY CONCENTRATE—GRANULAR

A new method of impregnation heptachlor on granular sorbents will make available very dependable granular formulations in a range of from 5 to 40% actual insecticide. The stratification of certain granular insecticide materials in fertilizers can probably be minimized by selecting a granular material of the optimum bulk density to match your fertilizer.

Field tests carried out in 1954 showed some very interesting results with the use of insecticides on granular vermiculite which has resulted in a renewed interest of this medium. A new insecticide grade of Vermiculite 16-60 mesh has been introduced and forty percent insecticide has been prepared on these granules.

The installation of a star feeder will handle granular insecticide in the same manner as sticker concentrate.

LIQUID CONCENTRATES

Liquid insecticide concentrates have been added to fertilizers by impregnation in blenders and by impregnation on vibrator troughs and belts. Diagram Number 2 shows an improved installation for impregnation on a belt or trough.

While to some extent, you are limited in the range of concentration of insecticide, you can apply to fertilizer without stopping to change nozzles, it is possible with several manifolds containing sets of precalibrated nozzles to swing a new manifold into position when a change in insecticide application is needed.*

ADDITION OF INSECTICIDE TO LIQUID FERTILIZERS

Liquid emulsifiable insecticide concentrates have very recently been developed (note 1) to add to mixed liquid fertilizer and to nitrogen solutions which provide excellent emulsions that remain stable during the normal application period. The concentrates are designed for a broad application, and the stability of the emulsions varies depending on the fertilizer formulation.

For any one formulation of fertilizer, an emulsifiable insecticide concentrate can be made that will provide very stable emulsions.

A liquid suspendible heptachlor powder (Note 2) which has been prepared by new methods of insecticides impregnation is available to add to mixed liquid fertilizers. This powder remains in suspension with the minimum agitation provided by the motion of the spray truck.

TREND IN FERTILIZER-INSECTICIDE MIXTURES

In presenting consumption data on fertilizer-pesticide mixtures, it will be seen that many problems that have been posed simply do not exist. Insecticide comprised 95% of the pesticide materials added to fertilizer in 1954, and these insecticides were, except for an insignificant amount, chlorinated insecticides used to control soil insects. Questions arising from the use of other pesticides, while certainly important to the individual manufacturer using those materials, are not major problems to the industry.

Several years ago, we were concerned with the chemical stability of various chlorinated insecticides added to fertilizer. It has been shown that the insecticides such as aldrin, chlordane, DDT and heptachlor, are compatible with the fertilizer components; that the insecticide formulators are providing stable insecticide concentrates for use with fertilizer. It has been shown that these insecticides are very persistent in the soil and that certain soil insects can be controlled for several years by one application. Tests are now being conducted to measure residual insecticide activity when fertilizer-insecticide mixtures are simply broadcast on the top of the ground in a fall-of-the-year application.

It has been stated regarding the practice of adding insecticide to fertilizer, "If the industry had any reasonable assurance that this practice were here to stay, for even several years, we could afford to install proper equipment to do this job on a uniform, economical basis and eliminate most of all the problems that now give us concern."

The increasing consumption of fertilizer-insecticide mixtures as shown in Table 1 indicates that for several years at least the industry will be called upon to provide these mixtures and in many cases some very sound reasons can be advanced as to why economical and versatile equipment should be installed to apply insecticides to fertilizer.

This increasing demand for fertilizer—insecticide mixtures by the farmer is not just happenstance. Farmers are demanding fertilizer-insecticide mixture because—

1. There is a very significant and often overlooked fact that almost perfect control of soil insects is provided by soil insecticides applied in fertilizer-insecticide mixtures. The distribution, for instance, of one pound of insecticide per acre by use of 99.5% fertilizer diluent is far more perfect than if the insecticide were applied separately, and because of the nature and care of spreading fertilizer, more perfect than if this insecticide were applied in any other media. Not only is the insecticide properly distributed when applied in fertilizer mixtures

Note 1. The Emulsol Chemical Corporation, Chicago, Ill.

Note 2. The Velsicol Chemical Corporation, Chicago, Ill.; Dr. P. B. Polen—private communication.

*The use of dependable flow meter will make it possible to quickly change your rate of insecticide application. The two drum installation provides for changing drums or insecticide application as needed.

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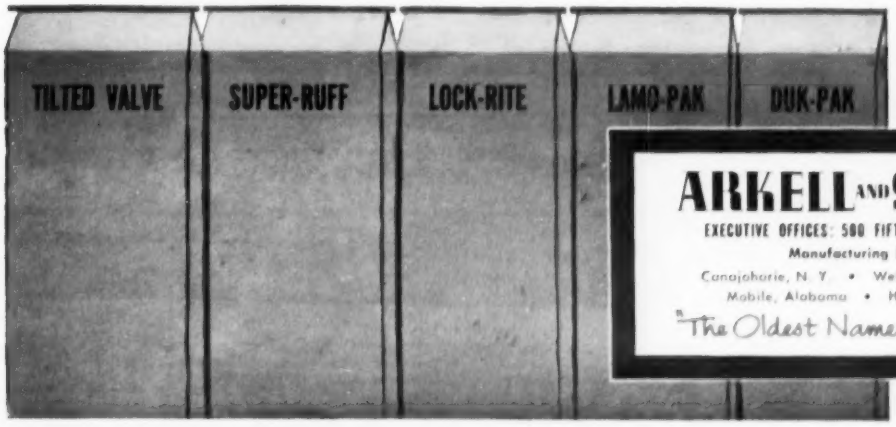

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Table 1. Estimated Use of Fertilizer—Insecticide Mixtures (In Short Tons)

Year	Total Mixed Fertilizer	Fertilizer Insecticide Mixtures	Increase In Tons	Increase In Per Cent	Per Cent Total
1952-3	15,722,000	82,500			.5
1953-4	15,541,000	141,500	59,000	71	.9
1954-5	15,151,000	200,000*	58,500	41	1.3

*USDA estimate based on incomplete returns.

but it is an established fact that these soil insecticides provide insect control throughout the growing season.

2. The farmer saves time before planting when every hour is crucial. In many sections, because of climate there is so little time between the time a farmer can get into his field and the time he has to plant his crop that he has to make a decision between the various preparations of his soil and choose only the ones that are the most urgent.

3. It is estimated that the farmer saves about $1.40 per acre by applying fertilizer and insecticide in one application.

4. The one application of fertilizer and insecticide, together, helps certain farmers who wish to take advantage of the winter soil conditioning and do not want to work their soil more than a minimum number of times.

A second reason for installing versatile and economic equipment to add insecticide to fertilizer is that equipment installed to add the present registered insecticides will be protected from obsolescence due to the introduction of new pesticides for at least several years. Before a new pesticide can be registered, usually three years or more field testing is necessary and a half million dollars is considered a conservative cost to develope the pesticide for field use. It is most probable that your equipment can be readily adapted to any new pesticide entering the market. Instead of fearing the advent of new and more numerous pesticides to add to fertilizer, it may be a definite advantage to purchase adequate and versatile equipment now to capitalize on any newly approved fertilizer-pesticide formulation.

A third reason for installing versatile and economic equipment to add insecticide to fertilizer involves the design and purchase of equipment that will not in any way slow your rate of fertilizer production. When more than one percentage of insecticide application is being made to your fertilizer or when more than one insecticide is applied you must have equipment installed that can change rates or materials without stopping production. "Downtime" for any reason during the production season is one of the most expensive factors in your costs.

A fourth reason not only to justify versatile and economical equipment but to justify the practice of adding insecticide to fertilizer itself is the profit derived. While a 10% profit may be realized in fertilizer, an average margin of $10.00 per ton over material costs is available in the insecticide increment of your mixtures.

A fifth reason for installing new and versatile equipment is the need of assurance of each formulator that he is invariably adding the correct amount of insecticide to this fertilizer that the distribution of this insecticide is complete enough to provide insect control and meet regulations.

Some critical consideration must be given to what kind of a content tolerance should be established for insecticide in fertilizer-insecticide mixtures. Taking into consideration the excellent distribution of the insecticide in field application by the fertilizer media and the very good control of soil insects that has been obtained by insecticide in these mixtures, we must realize that even at the present state of the art we are doing a fair job. Our dissatisfaction stems not from insatisfactory performance but from our own uncertainty as to what we are producing or as to what limits of homogeneity we should obtain in these mixtures. We must realize that limits established for straight insecticide formulations need not necessarily apply to fertilizer-insecticide mixtures and that any effort expended in mixing of fertilizer and insecticide for better homogeneity beyond that degree of mixing that provides perfect field control is an economical loss that must be avoided. It will be necessary for the regulatory agencies to use field control provided by the insecticides in fertilizer-insecticide mixtures as a guide to set specifications on the homogeneity of these mixtures.

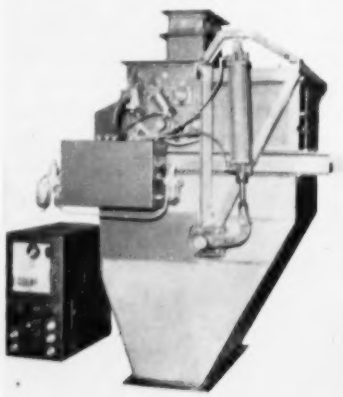
There seems to be a large amount of uncertainty as to the danger of using insecticides in fertilizer. The chlorinated insecticides are provided in formulated concentrates for the fertilizer industry. Even the technical materials carry a "Caution" label and not a "Warning" label. By the correct use of application equipment, very little insecticide should escape from the fertilizer to constitute any sort of health hazard and in these situations where the unpleasant odor of liquid concentrates is objectionable, dry nondustable sticker insecticide concentrate is available which offers no odor in formulating with fertilizers.

Nitrogen Division Offers Urea-Formaldehyde Solution

A new urea-formaldehyde solution, which will enable fertilizer manufacturers to produce granular-type fertilizers containing long-lasting organic nitrogen for lawns, gardens, and specialty crops, has been announced by Nitrogen Division, Allied Chemical & Dye Corporation.

The new solution, called "N-dure," produces complete fertilizers in which the nitrogen is released to plants over an entire growing season and makes fertilizer mixtures that are non-burning and leach-resistant.

Nitrogen Division is producing N-dure at its South Point, Ohio, plant. Shipment in insulated steel, tank cars.



The Thayer Scale and Engineering Corporation, Rockland, Mass., has recently developed this new material feeder designated as Model 700N Batching Scale. The pilot model has recently completed a one year test in a large nickel producing plant in handling and discharging nickel oxide ore to reduction furnaces. Model 700N bulletins and survey sheets on Model 700N Batching Scales are available upon request. Please write directly to Thayer Scale and Engineering Corporation. Attention: Mr. F. L. Thayer, Sales Director, Rockland, Massachusetts.

40-HOURLY-TON GRANULATING PLANT FOR KINGSBURY & CO.

Kingsbury & Company recently placed in operation a 40 ton per hour granulating plant at Peru, Indiana. This unit was furnished by The D. M. Weatherly Company of Atlanta, Georgia.

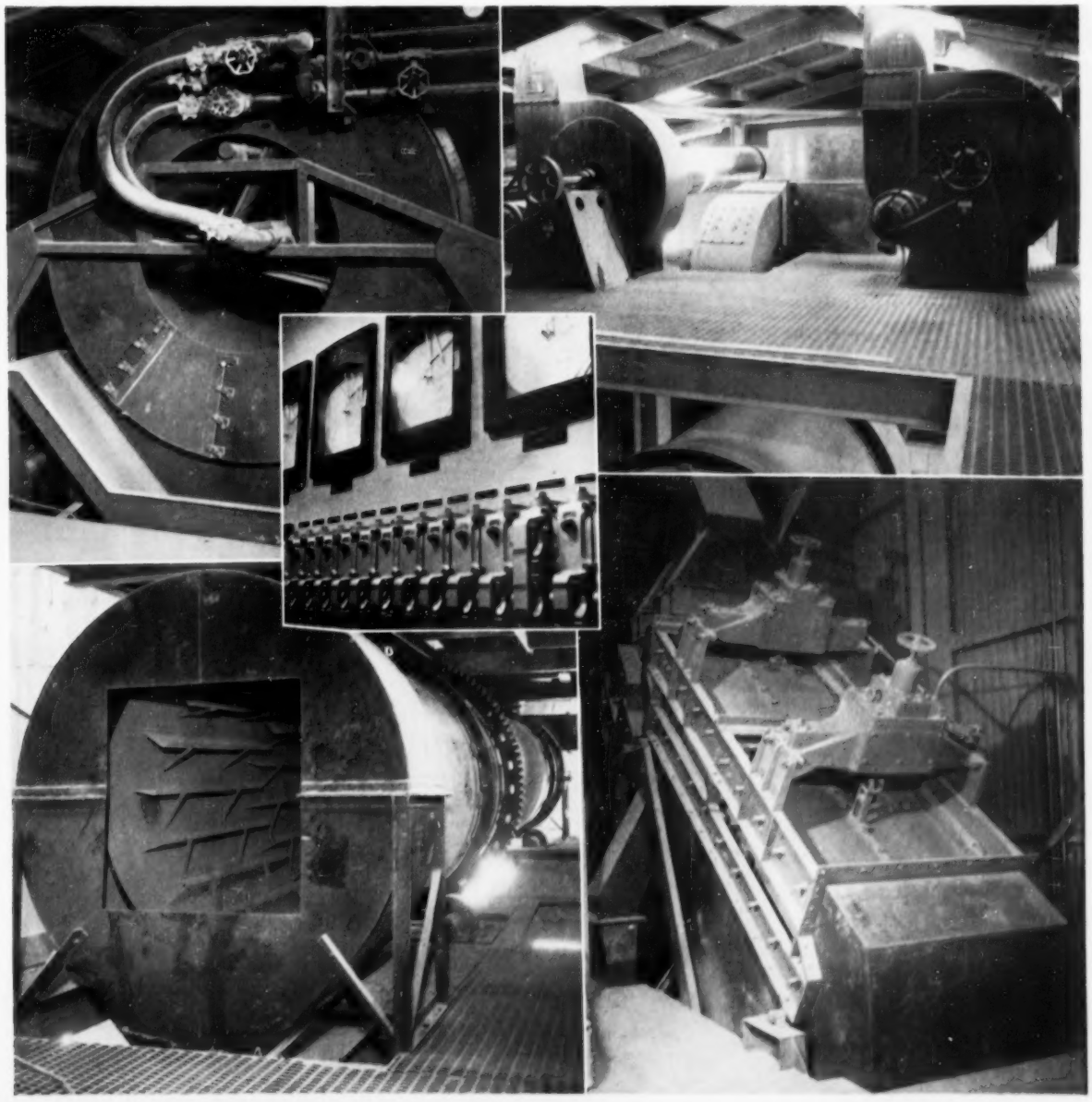
A minimum of building modification was required for installation of the new granulating facilities. A small penthouse 10' wide x 16' long and 12' high was required for housing the head of one bucket elevator. The only floor space taken up was the amount required for setting one bucket elevator.

PROCESS

The new granulating plant utilizes the Weatherly Controlled-Granulation Process. Solid raw materials are weighed and premixed and then placed in a surge hopper. Beneath the surge hopper is located a continuous weigh feeder which can be set for the desired production rate. This feeder weighs the solid raw materials continuously which are then introduced into an ammoniator of the T.V.A. type. The ammoniator shown is 7' dia. x 10' long. The liquid raw materials, anhydrous ammonia, nitrogen solution and sulphuric acid, are continuously introduced into the ammoniator where the reactions take place and granulation results.

The instrument panelboard has the flow recording, controlling and integrating instruments mounted on it. All of the pushbuttons for starting and stopping the equipment in the granulating plant are also located on the instrument panel. Each pushbutton has an indicating light to show the equipment is running.

The granulated fertilizer discharged from the continuous ammoniator goes to a rotary dryer. This dryer is 8' dia. x 40' long. A combustion chamber 8' dia. x 12' long is located at the feed end of the dryer which makes the unit operate in a co-current fashion. The dryer is fired with natural gas, utilizing automatic burning equip-



ment and the exit and inlet temperatures are controlled to pre set levels.

The exhaust fan for the dryer and cooler is shown with the cyclone dust collectors in the background. Beneath the fan floor the rotary dryer can be seen.

After the granulated fertilizer is dried it passes through the 7' dia. x 40' long counter-current rotary cooler shown. After cooling, the fertilizer is elevated and carried to the classification stage of the process. Two 4' x 10' two surface Tyler Hum-Mer Screens are used for sizing the product. The oversize is carried to a 42" cage mill for cracking and is screened again. The fines that pass through the bottom screen deck are carried to the ammoniator where they are granulated along with the fresh material. The product which is classified and removed on the top of the bottom deck of the screen is carried to storage by belt conveyors. The screen specifications on the product are through a 6 mesh screen and retained on a 16 mesh screen.

BUTLER INTRODUCES LIQUID 'PACKAGE UNIT' PLANTS

KAW INSTALLATION NOW IN OPERATION

Offering low plant and manufacturing cost while providing complete flexibility, "package unit" liquid fertilizer mixing plants will permit easy, inexpensive entrance into this comparatively new and potential field. Designed and built by the Butler Manufacturing Company, Kansas City, Missouri, each unit will include mixing equipment, aqua conversion system and all necessary storage facilities. Even the building to house office and equipment may be specified in this package arrangement.

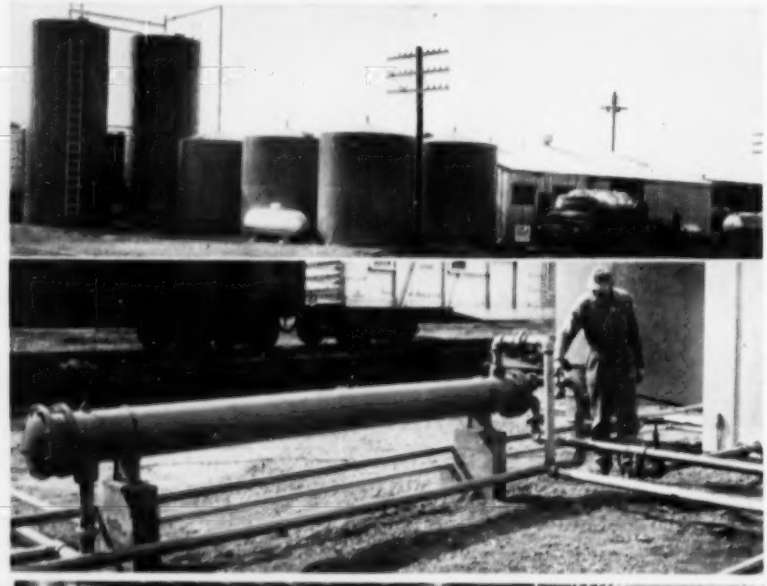
The new liquid fertilizer mixing plants may be obtained as a turnkey installation or as ready-to-install units. In the latter case, Butler will provide required equipment, engineering and supervision. The customer need only to supply the site and necessary labor.

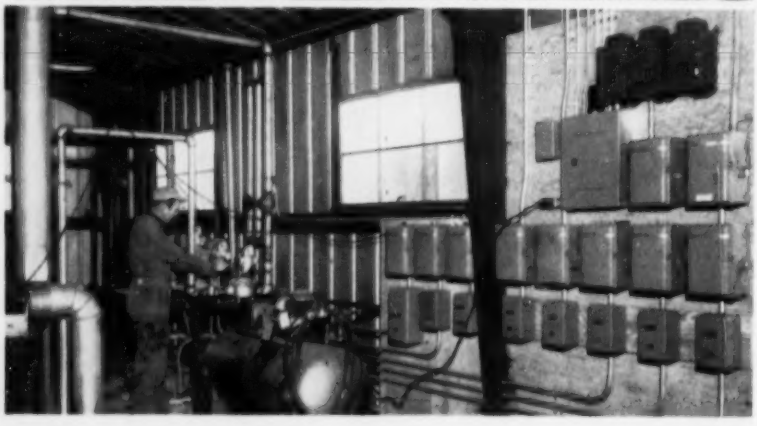
Each plant will be able to process 10 to 15 tons per hour, depending on the grade of fertilizer. This will include the production of straight aqua ammonia, popular liquid fertilizer grades and custom formulation. Liquid raw materials are delivered to the mixing tank through a system of meters and flow regulators accurate to 1/10th of 1%. Urea and potash are dissolved in the batch mixing tank through mechanical agitation.

Aqua ammonia used in the mixing process is converted from anhydrous ammonia directly from tank car or transport to Butler's own aqua ammonia conversion system. It may then be sold for direct application as 20-0-0 grade.

Storage facilities with the package plant permits a wide and flexible selection. Aluminum tanks for nitrogen solutions; black iron tanks featuring special plastic Flexi-Liners for phosphoric acid, and black iron tanks for the storage of neutral grades of liquid fertilizer are available.

All three types may be obtained in a large selection of capacities plus sizes to suit specific needs will be available upon request.





← Key to pictures.

Top: A typical installation of Butler liquid fertilizer mixing plants is the Kaw Fertilizer Service, Inc. of Lawrence, Kansas. This overall view shows storage facilities, including a Butler building which house equipment and office. **Center:** Shown is heat exchanger used for cooling aqua ammonia and mixed grades of liquid fertilizer. Tank in background is FXL unit comprised of vertical black iron tank and special plastic Flexi-Liner. This unit is used for the storage of 75% phosphoric acid. **Bottom:** Simple, one man operation is assured with complete electrical panel. This is really a push button operation from start to finish with a system of meters and flow regulators accurate to one-tenth of 1%.

St. Regis To Open New Plant

St. Regis Paper Company announces that it will commence multiwall bag manufacturing operations at a new plant at Kansas City, Missouri, early this summer. The 100,000 square foot plant is leased from the Southern Development Company of Kansas City with option to purchase. St. Regis will move in about June 1, 1956.

Around the Map

RED FACE DEPT.

In February we ran an item about the new Houston plant of Houston Fertilizer Assn., and put it under the heading of Texas. It turns out that the Houston involved is in Mississippi.

* * *

In March the printer, accustomed to setting the familiar "CF Staff Photos" headed the cutlines on page 31 with this phrase, when the caption should have read "MWSIC Staff Pictures," and he omitted credit entirely on page 26. Actually, we are indebted to the fine photography of the Middle West Soil Improvement Committee staff for both these groups of photos. The three other batches of pictures included in the meeting report REALLY are our own staff photos.

P.S.—We now have a new printer.

ARIZONA

Thunderbird Chemicals, Inc., have bought 80 acres near Phoenix as a site for the $10,000,000 plant they have announced. They paid $60,000 to the Salt River Valley Water Users Assn. for the property.

* * *

Mohawk Fertilizer & Supply, Phoenix, has been incorporated to manufacture and distribute fertilizer.

CALIFORNIA

Swift & Co. are planning a plant near Merced which is expected to be equipped to produce complete liquid mixed plant foods, insecticides and some raw materials. **Carl LaVo** will be in charge.

* * *

Stauffer Chemical will build their fourth California sulphuric acid plant at Dominquez. To cost some $2,000,000, it is scheduled to be in production early next year. Hans Stauffer, president, says the current and anticipated need for the acid in Southern California calls for the project. Their present sulphuric plants are at Richmond, Vernon and Dominquez.

* * *

California Spray-Chemical Corporation, recently released an interim report on the progress of the various portions of the $16,000,000 fertilizer plant being built near Richmond.

In the report P. S. Williams, chief engineer, stated that construction has passed the halfway mark on schedule and that Calspray is expecting to be able to ship the first nitric acid some time around the middle of this month. Other portions of the operation will go on stream as they are completed, the last of which is expected to be producing by Fall of this year.

The fertilizer plant is a radical departure in the manufacture of synthetic plant foods, the PEC process. To break down phosphate materials for infusion into complex mixed fertilizers, Calspray's plant will use nitric acid obtained through processing basic raw material produced by **Standard Oil Company's** new anhydrous ammonia plant. With nitric acid as the main acidulant and by-product sulfuric acid or phorphoric acid as the secondary actuators, phosphate rock will be broken down for inclusion in the fertilizer.

COLORADO

Alamosa Cooperative, Alamosa, are planning a drive for finances to build an anhydrous ammonia bulk plant there.

FLORIDA

Swift & Co. will build a fertilizer plant at Pompano Beach. According to Swift's Winter Haven manager, **J. W. Whitaker,** the plant will be in operation by Fall.

GEORGIA

Southern Nitrogen's groundbreaking ceremonies featured prominent figures. Congressman **Prince Preston;** Georgia's commissioner of agriculture—**Phil Campbell; L. C. McClurkin,** chairman of the Savannah District Authority, who presided at the ceremonies. Company president and board chairman, **John R. Riley** commented: "The Southeast is the prime nitrogen market in the United States. This step is certain to be beneficial to the area because of lowered distribution costs." Vice-president of Southern Nitrogen, in charge of operations is **Richard F. Brown,** formerly vice president and general works manager of **Spencer Chemical.** The plant will produce 250 daily tons of anhydrous ammonia, much of which is to be converted into nitrogen solutions for use by fertilizer manufacturers in the area.

ILLINOIS

National Distillers' division, USI, has awarded contracts for some $10,000,000 of construction on the **National Petro-Chemicals** site at Tuscola. **Catalytic Construction** will build the phosphoric acid plant with a capacity of 60,000 daily tons—a logical addition to USI's present production of anhydrous, solutions and sulphuric. **Singmaster & Breyer** will construct the new isosebacic acid plant, with an annual output of 150,000,000 pounds.

* * *

Hy-Yield Soil Service are in oper-

ation with their new $165,000 mixing plant at Mt. Carbon, which was begun in November last year. It has 2,000 tons storage capacity, a 45 foot unloading elevator and a 58 foot mixing tower, according to manager **Rodell Rhine.** A soil testing laboratory occupies its own building at the plant.

* * *

Krebs Fertilizer Co. has opened a new plant at Springfield.

* * *

Charles T. Gildersleeve & Son, Hudson, have added to their long established hybrid seed corn business a liquid fertilizer plant with a capacity of 20 hourly tons. The first analyses to be offered are a 4-10-10 for oats and a 12-6-6 for corn. Custom formulating will be offered, as will custom application. The total capacity of their storage and mixing tanks is 90,000 gallons.

* * *

J. C. Carlile Corporation was given the contract for modernizing the **Aylward Fertilizer** plants in Illinois, and supplied them with their new aqua ammonia portable converter unit, which is in operation throughout Illinois. This is the first unit of it's type built, having the Carlile features of simplicity in operation and ability to be attached to the aqua storage locations in a matter of minutes. The unit is a completely mobile high capacity unit.

* * *

Victor Chemical will increase its Chicago Heights plant capacity 50%, according to August Kochs, chairman.

KANSAS

Union Farm Supply Inc., Beatrice, Nebraska, has bought the nine nitro fertilizer plants in Kansas. They already owned seven plants in their home state.

KENTUCKY

Spencer Chemical have announced new facilities for aqua ammonia and concentrated nitric acid at their Henderson works. The aqua unit was scheduled for completion the first of this month, but the nitric facilities are still in the design stage, according to word from **Kenneth A. Spencer,** president. It is known, however, that the new nitric facilities will produce up to a 68% acid, as compared with their present 55% units.

MISSISSIPPI

Mississippi Chemical's projected $5,000,000 Pascagoula plant has been chartered as **Coastal Chemical Corporation** with what is said to be the largest authorized capital of any charter initially issued in Mississippi—400,000 Class A common. Further details of the fertilizer planned shows it will run from 42% to 60% plant food. Construction is not expected to get underway until late Summer or early Fall, according to **Owen Cooper,** MCC's executive vice president.

MISSOURI

Central Missouri Chemical and Mineral Corp., Jefferson City, is buying equipment to produce liquid nitrogen fertilizer, to add to the present line of mixed plant foods. Owners are Mr. and Mrs. **James Wunderlich** and Mr. and Mrs. **Ralph Roling.** A six-truck application service is rendered.

NEBRASKA

Great Plains Service, Ashland, has acquired the anhydrous bulk plants at Waverly, Eagle and Murdock, formerly operated by **Spidel Farm Supply** of Waverly. **Ben**

MFA's New Bulk Mixing Plants Feature Unusual Design

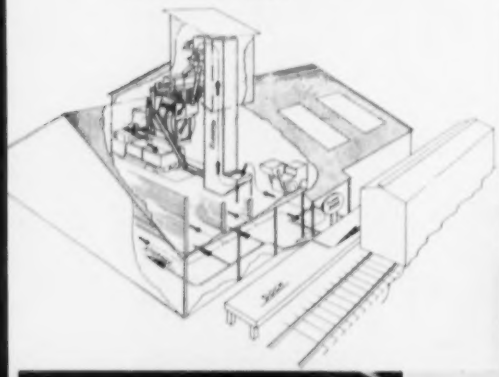
During the past year, Missouri's map has become dotted with bulk dry-mixing plant locations selected by Missouri Farmers Association to extend the effective range of its bulk-distribution operations.

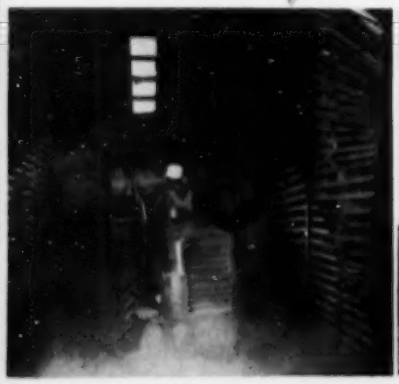
Financed jointly by local participation and MFA funds, each plant is planned to serve a 30-mile radius, and to be supplied from one or more of MFA's complete fertilizer operations at Springfield, Joplin and Maryland Heights.

The satellite plants—located at Albany, Butler, California, Centralia, El Dorado Springs, Gallatin, Lockwood, New Florence, Rolla, Slater and Union—are rated at 3000 annual tons by MFA, and have 1000 tons storage capacity.

Fabricated by Riback Industries, Inc. of Columbia, Mo., an industrial distributor for Worthington Corp., the plants are designed for a strictly bulk operation and have no facilities for bagging.

When a specified grade is ordered, a tractor shovel hauls materials from the storage bins across a large floor scale and dumps into an elevator. The elevator lifts the goods to a screen which leads a Worthington one-ton batch mixer, recycling coarse particles to the elevator intake grate. Powered by a 10-h.p. TEFC motor, the mixer—mounted directly above the truck loading bay—handles a capacity load in 30 seconds, then discharges directly into the spreader or transport waiting below.





Upper left: Cutaway drawing reveals construction and design details of typical MFA bulk mixing plant fabricated by Riback Industries. Arrows give flow diagram. **Upper right:** View from rail spur track shows platform and rear side of buildings. **Lower left:** Tractor shovel dumps muriate of potash into storage bin after bringing material from rail car. **Lower right:** Spreader truck is readied to receive batch of mixed goods which will be discharged directly from overhead mixer into truck body.

Spooner is in charge of the three plants.

• • •

Amick Farm Supply, Papillon, has bought the fertilizer and lime business of **John Latham,** Springfield.

• • •

Cooperative Fertilizer has put into operation its new anhydrous ammonia plant at North Platte, with an 8,000 gallon tank and application equipment.

NEW YORK

Facerform Corporation, NYC, are planning to market a new type of phosphate fertilizer covered by four patents and developed by the late **Leroy Henry Facer.** Experiments with tomatoes in New Jersey and wheat in upper New York state are said to have resulted in surprising high yields. The process utilizes phosphate rock not hitherto regarded as good raw material,—low in phosphorus, high in iron and aluminum.

Phosphate rock and sulphuric acid are mixed and pelletized. The pellets are then coated with dry rock powder. This produces "a new phosphate compound not fully identified."

Patent numbers are 2,739,885; 2,739,886; 2,740,115 and 2,740,116.

NORTH CAROLINA

Albemarle Chemical Company opened last month the first mixed liquid fertilizer plant in North Carolina at Winfall, and seems to have run into a price war from the start. Manager **Ralph Sasser** says his prices will remain competitive. The company is owned by **Rufus Harrell, Emmett Winslow** and **Phillip Thatch.** They are listing four grades: 3-9-9; 5-10-10; 8-8-8 and 4-12-12.

OHIO

Tyler Grain & Fertilizer Co. Wooster, is building a new fertilizer plant at Weilersville, according to president **Walter F. Tyler.** The plant will include a new storage building, batching hoppers and Weatherly controlled-granulation plant. High analysis granular fertilizers with a particle size range between 6 and 16 mesh will be produced at a rate of 20 hourly tons. Construction has started with completion date set for July to be in operation for the Fall season. Engineers for the new plant are **The D. M. Weatherly Company,** Atlanta, Ga.

• • •

Virginia-Carolina's plant at Orrville, started December 1, was scheduled to be completed the first of this month and to be in production by late Spring. It is a 250 by 157 foot building, covered with corrugated asbestos cement.

OREGON

Pacific Supply have in production their new $500,000 liquid fertilizer plant in Ontario which can convert a railroad carload of anhydrous ammonia to aqua ammonia every five hours. It will also produce 8-24-0 liquid fertilizer.

• • •

Soil Aid Corp. are about to build a plant to produce soil conditioners at Echo, according to **Ken Payne,** president.

PENNSYLVANIA

Sun Oil are in operation with their $10,000,000 Marcus Hook anhydrous plant, which is designed to turn out 300 daily tons. It is the largest of its type in the US to operate on by-product hydrogen from petroleum.

• • •

Atlantic Refining is slated to put $11,500,000 in its Philadelphia plant. A portion of the investment is to increase anhydrous ammonia production there from 100 to 175 daily tons.

TEXAS

Gulf Liquid Fertilizer has opened main headquarters in El Campo. The concern has more than twenty outlets in central and south Texas. **Claude King** is general manager.

VIRGINIA

Nitrogen Division's Hopewell expansion program, reported here in March, can be told in a little more detail now. Completion of the plant, on which construction has already begun, is scheduled for late this year. The product is a pebbled and coated one, 33.5% N to be produced in the new plant, and the project also involves extensive changes in the existing end products subdivision so as to increase the present ammonium nitrate output.

Linking the present plant with the new will be a mile long stainless steel pipe-line through which ammonium nitrate solution will be pumped. Storage will be kept to a minimum because the plant has been designed to produce large quantities as needed to meet seasonal demand.

The ammonium nitrate will be sprayed from the top of a 175 foot high tower, hardening into pebbles on the way down. After cooling the pebbles will be coated and bagged for shipment.

AFRICA

African Explosives & Chemical Industries are coming along with their $5,600,000 plant at Natal which produces sulphuric acid via the Peterson process.

* * *

African Pyrethrum Development, a New York concern, are building in Nakuru a pyrethrum plant with 3,000 annual tons.

* * *

Societe pour le Traitement des Produits Agricules au Kivu are building a 2400 annual ton extraction unit at Goma, which is being engineered by **Societe Belge de l'Azote** of Liege, Belgium.

CANADA

Northwest Nitro-Chemicals' plant at Medecine Hat, started in July of last year should be completed this year, according to J. Albert Woods, president of **Commercial Solvents** which owns 42.7% of the equity stock and which will operate it under a long-term management contract.

* * *

North American Cyanamid whose doubling of nitrogen solution capacity at the Welland plant was reported here last month are also modernizing their Ingersoll, Ont., quarry with improved sizing and screening equipment. **D. McC. Collette,** manager of the Niagara plant says the 400,000 annual ton limestone plant will be upped considerably and will increase personnel from 70 to nearly 100.

INDIA

Five year plans for India include three fertilizer plants—at South Arcot, Nagal and Rourkela which jointly will produce more than 200,000 annual tons of fixed nitrogen, which will mean that by the end of the second five-year plan India will be producing some 370,000 annual tons of fixed nitrogen.

ISRAEL

Electrochemical Industries' $3,000,000 plant at Haifa has gone into production, producing chlorine, caustic soda and pesticides. This plant is a joint venture of American capital and Franco-Swiss technology. Over 200 are to be employed and the 20 buildings cover 24 acres of land.

JAPAN

Toyo Koatsu Industries and the **Teikoku Oil Co.** have joined hands to set up a plant in Biigata Prefecture to produce ammonia, urea and other ammonia products from natural gas hydrogen.

MEXICO

Petroquimica, S. A., newly formed concern, has plans to build two anhydrous and solid ammonia plants to the tune of $12,000,000. Guaymas has been established as the site of one, the other has not yet been announced. Each is expected to produce 35000 annual tons.

Farm Safety Clinic Added To President's Conference

A Farm Safety Clinic is being held as part of the President's Conference on Occupational Safety, May 14-16.

For the first time, agriculture is included within the scope of the conference. The U. S. Department of Agriculture is cooperating with the Department of Labor in this phase of the conference through the holding of the Farm Safety Clinic on May 15 in the Jefferson Auditorium, South Building, U. S. Department of Agriculture, Washington.

Purpose of the Clinic is to develop an appraisal of all possible resources for safeguarding farm people from accidents. This is to be done through general and group discussions.

In 1955 there were 310,000 disabling work injuries and 3,700 deaths resulting from farm work accidents. And while some encouraging progress has been made during the past few years, continuously expanding mechanization and the increased use of toxic chemicals in agriculture increases the hazards associated with farming.

NEW TREND IN AMMONIA PLANTS

LUMMUS' 60 T/D UNIT FOR WESTVACO

One of the least expensive ammonia plants ever built went on stream in October 1955 at the South Charleston, West Virginia plant of the Westvaco Chlor-Alkali Division, Food Machinery and Chemical Corporation.

It is a small, automatic unit designed to operate with a labor force of two operators per shift, and produce 60 tons per day of anhydrous ammonia from waste chlorine cell hydrogen. Carefully designed and engineered for low investment and low operating costs, and incorporating all the latest safety features, the plant will have an unusually short payout time.

This small, minimum investment unit may well be the prototype for agricultural and industrial ammonia plants of the future. Because ammonia cannot be shipped over long distances, many such units, properly placed at hydrogen, natural gas, fuel oil and other sources throughout the country, would conveniently serve limited local areas.

Lummus built the plant around existing Westvaco facilities in an extremely confined area (as shown in the above photograph) without interrupting any normal plant operations, yet completed the job ahead of schedule in a brief seven months, with an excellent start-up. Westvaco was pleased with the job all along the line, from idea through operation.

This is one of four ammonia projects by Lummus in the last two years, and adds another to the 700-plus major installations completed by Lummus throughout the world.

May we work with you on your next project?

The Lummus Company, 385 Madison Avenue, New York 17, New York. *Engineering and Sales Offices:* New York, Houston, Montreal, London, Paris, The Hague, Bombay. *Sales Offices:* Chicago, Caracas. *Heat Exchanger Plant:* Honesdale, Pa. *Fabricated Piping Plant:* East Chicago, Ind.

LUMMUS

DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

MORE S.A.W. PAPERS

Here are some more of the fine papers presented at the joint meeting of Southern Agricultural Workers and Southern Section, American Society of Agronomy, held at Atlanta, February 6-8, 1956.

The Economics of Grassland Farming

J. R. Sasser, *State Conservationist*
Soil Conservation Service, Tennessee

The movement toward grassland farming in the South has been an unsteady one until recent years when technological advances coupled with a favorable economic climate and administrative backing caused a great ursurge.

The present period of declining farm prices has left the Southern farmer with difficult decisions to make in the selection and scope of his farm enterprises. Further advances in the grassland movement are needed; but hard, cold economics and precise technology must play a greater role than before. This is a great challenge to professional agricultural workers to aid the landowner in this weighing-and-choosing process.

Managerial skills are increasing in grassland farming but capital available for safe investments continues to be a dominant restricting factor. Capital to invest in grassland farming is most restricted on the 41 percent of Southern farms with less than $1,000 a year incomes. These need our assistance more than the other 59 percent—not just rule-of-thumb guides but precise, scientific, and adequate help.

* * *

Establishing Bermuda Grass By Seeding

Edgar A. Hodson, *Agronomist*
USDA Soil Conservation Service
Little Rock, Arkansas

To control erosion and excessive run-off, a cover of permanent vegetation should be established and maintained on nearly five million acres of farm land in Arkansas—much of this land is too severely eroded or too steep to be used for cultivated crops. (That acreage does not include any land that would normally be used for timber production.)

The adapted erosion control practices included in the conservation farm plan not only must be effective, but also must be profitable for the operator to establish and maintain. Bermuda grass has proved to be one of the most versatile and widely adapted perennial grasses now being used in the conservation program in Arkansas for both erosion control and pasture. Bermuda has performed so well during the recent dry years, there is no question that it should continue to be used where a permanent cover is necessary for erosion control.

In addition to being drought resistant, it can stand more abuse from over-grazing than any other of our adapted pasture grasses and can, if necessary, survive on soils with lower fertility levels. It has been used for permanent pasture longer and has a wider distribution than any other cultivated grass in Arkansas pastures. The first sod planted in Arkansas was on the parade grounds of the old Military Reservation at Fort Smith in 1835. The oldest recorded pasture sod planting made near Fort Smith in 1892 is still one of the best in that area.

Establishing Bermuda by sodding is such an expensive and tedious job that it has been necessary to find some way of getting it established by less expensive methods. A great many operators have found that seeding can be done more economically and will produce results equal to or better than sodding. The best methods for seeding were learned by making numerous field trials under various conditions and with different kinds of farm equipment.

Among the first seedings that were made, it was noted that the best growth was always made when the seed were planted in the ashes where brush piles had been burned. This gave a clue that the burning reduced competition from weeds and other grasses while the seedlings were small and the ashes supplied much needed minerals. Winter killing of these first seedings was the next problem encountered. Plowing or listing the seeded areas in late autumn to cover the plants deep enough to avoid danger from winter killing proved to be too uncertain to recommend.

During the World War II years, farmers in the Bismark Community in Hot Spring County, Arkansas, needed to expand their pasture acreage to meet the forage demands for a rapidly expanding dairy industry. Labor for sodding was not available. Charles Smith, one of the Bismark dairymen, and Clarence Eaton, Soil Conservation Service Technician, made the necessary ad-

justments on a four-row vegetable seed planter to open a furrow, apply the fertilizer, and to plant the Bermuda seed in rows in one operation.

The fertilizer and seed deposited in the bottom of the open furrow were covered only by press wheels attached. Three pounds of seed with 300 pounds of 5-10-5 fertilizer in 24-inch rows produced a solid cover the first year. Winter killing was reduced to a minimum by leveling the ground by two or three light cultivations the first growing season, to establish the young plants deep enough in the soil to prevent freezing. Moderate grazing the first season helped to keep weeds and other grasses from shading the Bermuda plants and seemed to encourage the young runners to "peg down" and take root.

If the seed and fertilizer could be mixed safely in the bottom of an open furrow, it seemed reasonable to assume that it would be equally safe to mix them in the planter and avoid the necessity of using any special equipment.

It is common practice now to mix the seed and fertilizer and use any kind of row fertilizer distributor, provided it has a shovel for opening a furrow for the seed-fertilizer mixture and a press wheel for covering. On very rough land it may be necessary to open the furrow with a plow ahead of the planter.

There is a possibility that seed could be damaged by contact with high-analysis fertilizer. A mixture of seed and low-analysis fertilizer should be used as a matter of precaution, although seed and 10-20-10 have been planted with no apparent damage.

Broadcast seeding is not recommended except in areas where there is no danger from winter killing, and only on a well-prepared firm seed bed. The seed and fertilizer can be planted with any type of broadcasting fertilizer distributor or cultipacker-seeder.

These things are important for successful Bermuda seeding:

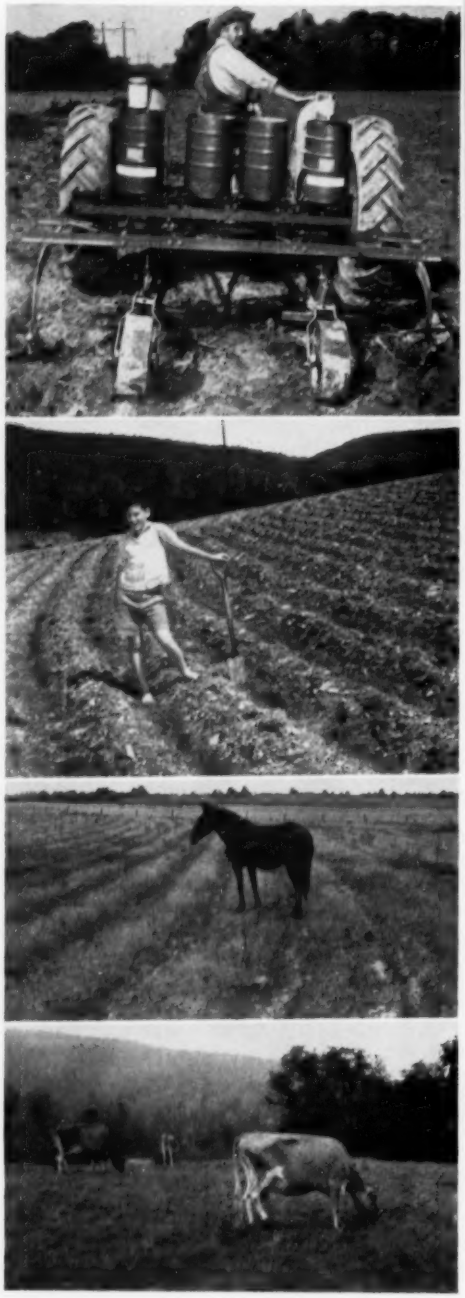
Plant hulled seed only.

Plant in late spring, after all danger of killing frost.

Cover the seed only with the press wheel on the planter or with a cultipacker roller.

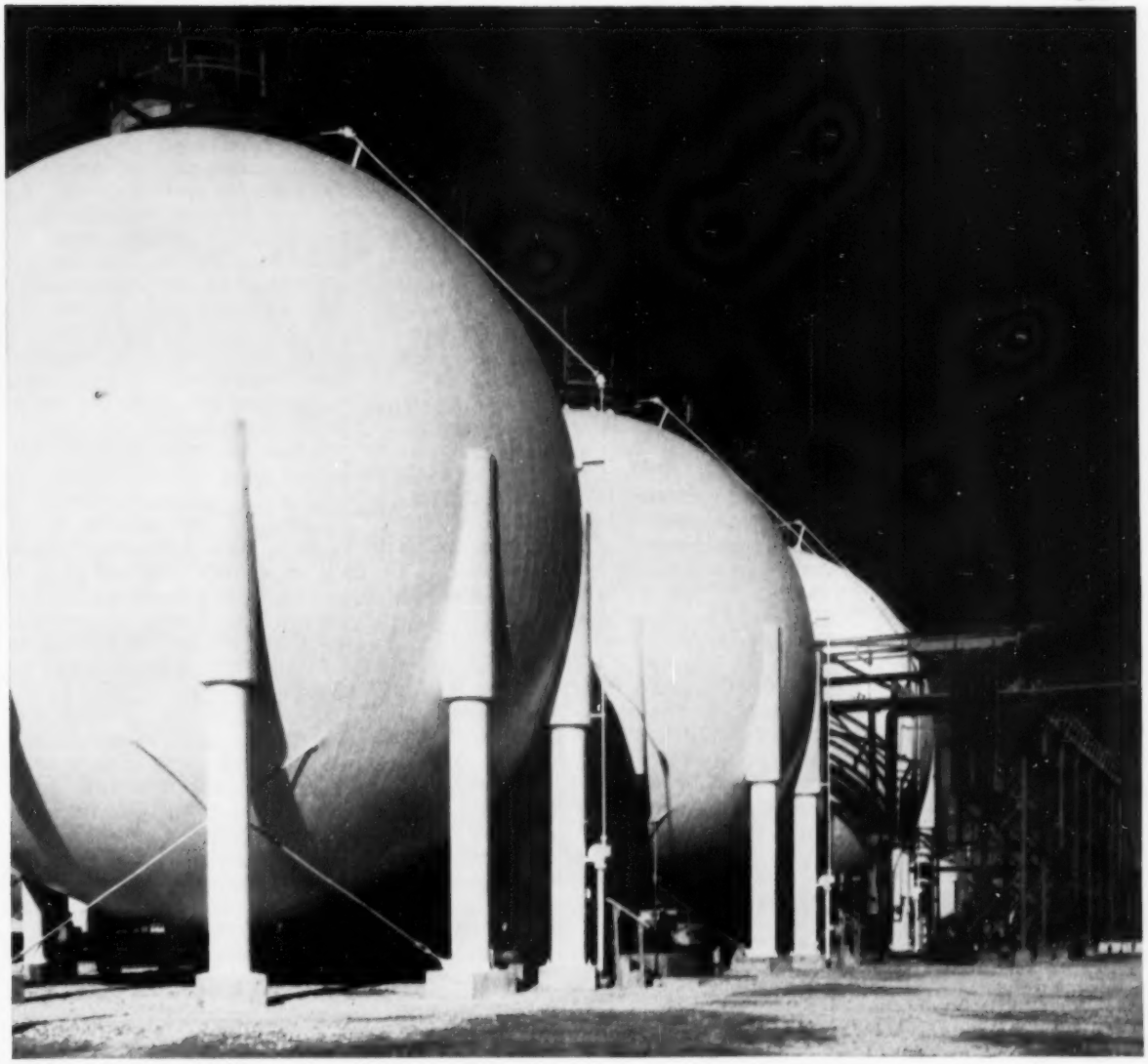
Allow limited grazing to help keep weeds and other grasses from shading the Bermuda, and mow if necessary.

Cover the young plants and level the ground by harrowing or by a light cultivation, as may be needed.



Top: Cultivator used in planting Bermudagrass seed. Seed are planted in open furrow and pressed into ground with wheels that follow. Fertilizer is also being applied in same operation. (Arkadelphia, Ark.) **Upper Center:** Photo taken June 7, 1955 shows Bermudagrass seeded in water furrow first week in May 1955. Seed mixed with 10-20-10 fertilizer applied at rate of 200 lb./A with 4 lb. seed. Tractor wheel was run in each furrow before planting, which was done with one-row fertilizer distributor. Tractor wheel was again run in furrow after seed was planted, to cover. (Batesville, Ark.) **Lower center:** Photo taken July 15, 1953 shows mule in field of Bermudagrass seeded in spring of 1952. (Conway, Ark.) **Bottom:** Eighteen-acre plot of Bermudagrass seeded last week in May 1955 is shown October 4, 1955. Twenty-five head of dairy cattle had been grazed about 50% of the time since July 1. Note that ridges have been leveled off during season to cover the bermuda deep enough to prevent winter damage. (Batesville, Ark.) **Photos by Edgar A. Hodson, USDA-SCS, Little Rock, Ark.**

DOW



At the Texas producing plant, synthesis gas reacts to form ammonia. This plant operates efficiently and continuously to keep ammonia costs down and assure prompt delivery. In a matter of hours, several days' production can be loaded for shipment.

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DOW

Effects of K and Na on Yields and Chemical Composition of White Clover

ALBERT E. KRETSCHMER, JR., and NORMAN C. HAYSLIP
Indian River Field Laboratory, Fort Pierce, Florida

The experimental area was planted to pangola grass and Louisiana white clover following a 1953 spring tomato crop. Semi-annual applications in quadruplicate of O, 50, 100, and 150 lbs./A of Na_2O (as sodium chloride) were superimposed upon treatments of 50, 100, and 150 lbs./A of K_2O (as muriate of potash). After fertilization on December 16, 1954, treated plots were harvested February 16, April 4, and June 3 to obtain yields and protein contents. Clover samples were obtained during each harvest and soil samples were taken in individual plots on the latter two dates.

Statistical treatment of the individual harvests indicated that for the second harvest the highest K_2O rate resulted in larger yields than the lowest rate. No effect of K or Na was apparent for the first or third harvest or when the three harvests were combined, even though the K contents of clover at the first harvest ranged from 1.43, 2.28 and 3.10 per cent for the 50, 100 and 150 lbs./A K_2O treatments, respectively. Soil tests confirmed the low K status in the soil of those plots receiving the two lowest K_2O rates.

Protein and P contents were not affected by differential treatments. Increasing fertilization with K_2O resulted in decreased Na accumulation by clover at all harvest dates, whereas increasing rates of Na_2O fertilization resulted in decreased uptake of K only for the first harvest.

Date of harvest had a definite effect upon the K, Na and P contents of clover, and on the protein and yields of the mixed forage.

It was difficult to understand why yields were only slightly affected by the differential K_2O rates when soil and tissue data indicated that K deficiency existed. On the assumption that differences in soil moisture between plots may have played a major role in forage production, the per cent moisture of individual plots was determined on soil samples collected December 15. Very little rain fell during the experimental period and also for a period of about 40 days previous to obtaining the soil moisture samples. Therefore, the plants obtained most of their water by means of a perimeter open-ditch irrigation system.

Real differences did exist between the soil moisture contents of certain pairs of the four replications, with values ranging from 9.4 to 12.8 per cent. Furthermore, there was a significant positive correlation between the higher soil moisture contents of individual plots and the higher combined yields of three harvests from individual plots. This information suggests that inadequate moisture in some plots may have been responsible for the lack of significant responses to the higher K_2O levels.

* * *

Cotton Yield Response to Magnesium Fertilization on Ruston Fine Sand

DAWSON M. JOHNS, GERALD E. WILCOX, and DARRELL A. RUSSEL
North Louisiana Hill Farm Exp. Sta. Homer, Louisiana

A six-year experiment was conducted on a Ruston fine sand to determine the effect of magnesium fertilization on cotton yields. The experiment was laid out in a randomized blocks design with six replications, using the following annual fertilizer treatments: 0-0-0-0, 48-48-48-0, 48-48-48-12, 48-48-48-24, 48-48-48-36, 48-48-36-18, and 48-48-24-24. The plot locations were maintained for the entire period of the experiment.

A positive linear yield response to the various rates of magnesium fertilization was obtained in 1950, the first year of the experiment. Similar yield increases were obtained from the cotton on magnesium treated plots in the succeeding years of the experiment, but the increases were not significant. Although significant yield responses were obtained only in 1950, visual observations of growth in subsequent years indicated that magnesium was exerting a positive influence.

From soil samples collected in the spring of 1954 and at the termination of the experiment in 1955, it was found that, after two years of fertilizer applications, the pH had decreased, the amount of available P, Ca, and Mg had been increased, but the level of available K had not changed.

The effect of the six years' consecutive treatments on the nutrient levels in the soil was as follows: The amounts of available P and K in the soil were higher on the fertilizer-treated plots, but the soil pH and amounts of available Ca and Mg were not changed; there were no differences in soil pH and amounts of available P, K, Ca, and Mg amongst fertilizer treatments;

Table 1. The effect of magnesium fertilization on cotton yields on a Ruston fine sand.

Treatment	Yield(1)—Pounds Seed Cotton Per Acre						Six Year Average
	1950	1951	1952	1953	1954	1955	
1 0- 0- 0- 0	279	677	474	673	325	336	461
2 48-48-48- 0	728	878	677	1395	550	985	869
3 48-48-48-12	801	880	661	1456	581	1074	909
4 48-48-48-24	823	829	808	1540	646	1150	966
5 48-48-48-36	859	971	724	1513	567	1185	970
6 48-48-36-18	766	889	646	1371	564	1083	886
7 48-48-24-24	837	991	741	1444	651	1159	970

(1) Mean for six replications

Table 2. Effect of fertilizer treatment of soil pH and available soil nutrients.

	Treatment	pH		P P M P		K		Ca		Mg	
		Spring 1954	Fall 1955	Spring(1) 1954	Fall(2) 1955	Spring(1) 1954	Fall(2) 1955	Spring(1) 1954	Fall(2) 1955	Spring(1) 1954	Fall(2) 1955
1.	0- 0- 0- 0	5.90	5.56	10.0	10.0	47	41	158	196	13	13
2.	48-48-48- 0	5.98	5.36	14.6	19.1	51	53	164	217	10	13
3.	48-48-48-12	6.00	5.42	17.0	18.7	50	53	148	187	11	11
4.	48-48-48-24	5.90	5.52	17.0	17.7	49	49	148	194	11	13
5.	48-48-48-36	6.00	5.45	16.0	19.7	54	54	161	200	13	13
6.	48-48-36-18	5.90	5.38	15.4	17.2	46	43	141	180	10	13
7.	48-48-24-24	6.00	5.50	16.0	18.8	48	48	150	200	13	14

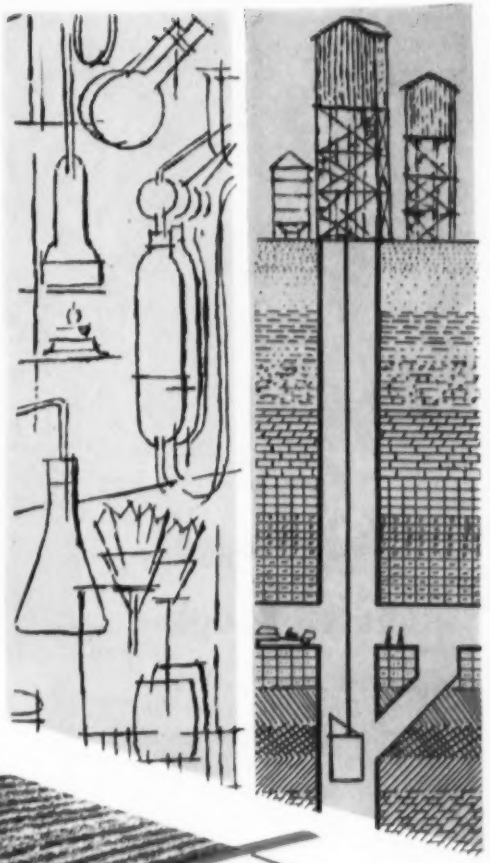
(1) Composite sample of six replications
(2) Mean for six replications

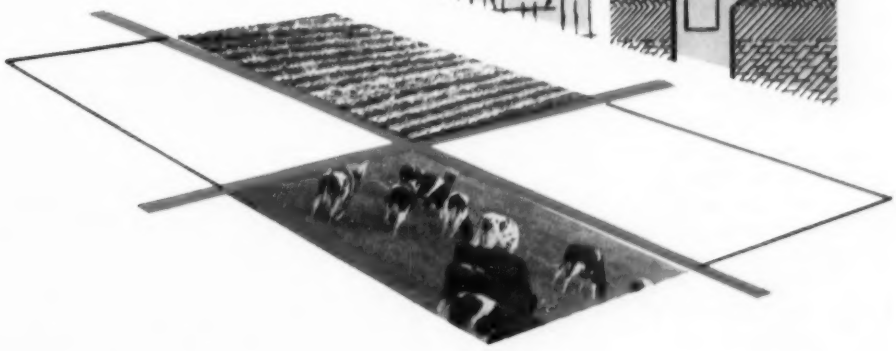
LOOK TO NATIONAL POTASH FOR QUALITY AND SERVICE

Backed by the skills and experience of its parent companies – Pittsburgh Consolidation Coal Company and Freeport Sulphur Company – NATIONAL POTASH offers important advantages as a dependable source of quality potash.

NATIONAL'S mining operations and refining processes will include the very latest industry techniques, and its storage and shipping facilities have been planned to meet efficiently the demand of the peak fertilizer season.

In addition, NATIONAL POTASH provides a free, comprehensive Technical Service to help manufacturers with granulation, formulation and other production problems. Write for complete information.





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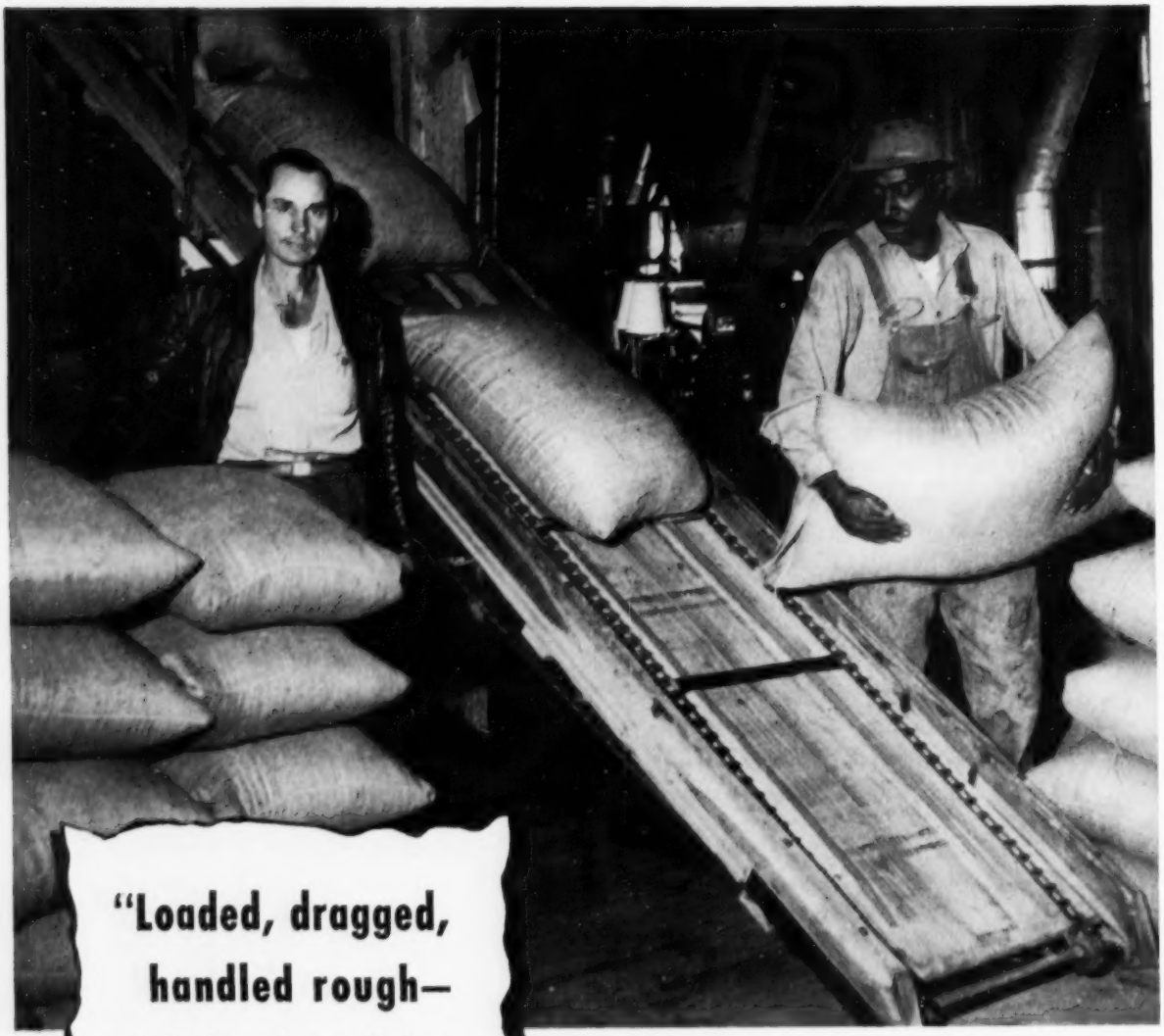

"Loaded, dragged, handled rough—

burlap bags take a terrific beating," says Fred W. Schroer of Valdosta, Georgia. "We buy about 480 tons of fertilizer a year in burlap bags we don't have to coddle. They can absorb moisture if a sudden rain comes up, and good air circulation cuts down mold.

"We wash the bags right away and use them for everything on the farm. In our hopper for grain we can bag with burlap in record time. We ship seeds all over the country in burlap bags and know they'll reach their destination in good condition."

You can sell more fertilizer when you pack in burlap bags because they make the farmer's work easier and they have *so many uses* around the farm.

Just ask your own customers—

they'll tell you that burlap

Is strong — takes dragging, dropping, *man-handling* — any tough job on the farm.

Gives good ventilation — keeps farm supplies and products fresh.

Laughs at sudden showers — wetness or dampness can't weaken it.

Saves money — extra value from re-sale and re-use.

Saves storage space — stacks to any height without slipping.

Has 1000 uses — always in demand on the farm (popular with farm wives, too!)

THE BURLAP COUNCIL

of the Indian Jute Mills Association

155 East 44th Street, New York 17, N. Y.

after six years of continuous cotton without the addition of any fertilizer, the available P, K, Ca, and Mg in the soil were 10, 41, 196, and 13 p.p.m., respectively, as compared to 18.5, 50, 196, and 13 p.p.m. for those plots receiving fertilizer applications.

* * *

Interrelationship of Yield, Plant Composition, Fertilizer Treatment, and Available Soil Nutrients in Cotton Production.

DARRELL A. RUSSEL, GERALD E. WILCOX, and DAWSON M. JOHNS
North Louisiana Hill Farm Exp. Sta. Homer, Louisiana

A four-year experiment was conducted on a Ruston fine sand to determine the interrelationship of yield, plant composition, fertilizer treatment, and available soil nutrients in cotton production. The experiment was laid out in a randomized blocks design with four replications. Sixteen treatments, varying in sources of N, Mg, and Na, and in rates of N, P, K, Mg, and Na, were used. The plot locations were maintained for the entire period of the experiment.

In a comparison of two sources of N, NH_4NO_3 increased the yields of seed cotton more than did $NaNO_3$ when the total yield of the four-year period was considered. When this same comparison was evaluated by individual years, there was no difference in yields for the N sources in 1952, a difference in favor of $NaNO_3$ in 1954, and a difference in favor of NH_4NO_3 in the other two years.

A positive linear yield response to 0, 24, and 48 pounds per acre of P_2O_5 was obtained for both sources of N. However, most of the yield response with NH_4NO_3 was between the 0- and 24-pound rates of P_2O_5, while most of the yield response with $NaNO_3$ was between the 24- and 48-pound rates of P_2O_5.

Potassium effectively increased the yield of cotton in this experiment only when applied with $NaNO_3$ as the source of N. An attempt was made to evaluate the substitution of Na for K but no conclusions could be drawn from the data collected.

Cotton leaf samples were collected at the first-blossom (July 14) and mature (Sept. 1) stages in 1954 and chemically analyzed for N, P, K, Ca, Mg, and Na. In a comparison of the effect of $NaNO_3$ vs. NH_4NO_3 as sources of N, it was found that: the Ca content in the first-blossom stage of growth and the N content at the mature stage were higher with NH_4NO_3 as the source of N; the Na content of leaves at both stages was higher with $NaNO_3$; and the Mg, K, and P contents were the same for both sources of N.

From soil samples collected at the termination of the experiment, it was found that the pH of the soil from plots treated with $NaNO_3$ was higher than that from plots treated with NH_4NO_3.

The adsorbed P content of soils that received NH_4NO_3 as the source of N was not changed by the addition of 24 or 48 pounds of P_2O_5 per acre annually. However, with $NaNO_3$ as the source of N, the adsorbed P in the soil was increased, but only with the 48-pound rate of P_2O_5.

Exchangeable K was higher for soils that received N from the $NaNO_3$ source than from the NH_4NO_3 source. The application of 48 pounds of K_2O per acre annually increased the K content of the soil, regardless of the source of N.

Exchangeable Ca was higher for soils from plots that received $NaNO_3$ than for soils from plots treated with NH_4NO_3. Soils that received annual applications of 48 pounds of P_2O_5 per acre, in conjunction with

$NaNO_3$ as the source of N, were higher in Ca than soils that received O or 24 pounds of P_2O_5 per acre. There was no difference in Ca content due to P_2O_5 treatment when NH_4NO_3 was used as the N source. Potassium applied at the rate of 48 pounds of K_2O per acre, with $NaNO_3$ as the source of N, increased the Ca level of the soil, but 48 pounds of K_2O per acre, with NH_4NO_3 as the N source, did not affect the Ca level.

Exchangeable Mg was higher in soils treated with $NaNO_3$ than in soils treated with NH_4NO_3. Neither P_2O_5 nor K_2O had an effect on the Mg content of the soil. The application of 48 pounds of MgO per acre in the form of dolomitic limestone resulted in an increased Mg content of the soil with both $NaNO_3$ and NH_4NO_3 as sources of N; 24 pounds of MgO, applied as Sul-Po-Mag, had no effect on soil Mg in this experiment.

The Na content of the soil was higher for plots treated with $NaNO_3$. No other fertilizer treatment had an effect on the exchangeable Na in the soil.

Yield of seed cotton as affected by fertilizer treatment.

Annual Fertilizer Treatment N-P_2O_5-K_2O-MgO-Na_2O	Yield[1] (pounds per acre) 1952	1953	1954	1955	Mean for years
0- 0- 0- 0- 0	768	1157	419	460	701
48- 0- 0- 0-109	705	1190	395	324	653
48- 0- 0- 0- 0	686	1318	368	528	725
48-24-48- 0-109	705	1290	618	866	870
48-24-48- 0- 0	727	1519	520	1152	980
48-48-48- 0-109	806	1644	588	1348	1096
48-48-48- 0- 0	700	1506	536	1299	1010
48- 0-48- 0-109	686	1293	504	457	735
48- 0-48- 0- 0	746	1340	452	749	822
48-48- 0- 0-109	702	1533	501	991	932
48-48- 0- 0- 0	700	1500	428	1005	908
48-48- 0- 0- 32	749	1576	523	1192	1010
48-48-48-24-109	702	1481	515	1070	942
48-48-48-24- 0	702	1391	495	1233	956
48-48-48-48-109	765	1555	460	1111	973
48-48-48-48- 0	770	1658	574	1280	1071

[1] Mean values for four replications.

MEETINGS

INSTITUTE TO MEET IN JUNE

Outstanding leaders in the field of Government, industry and agricultural communications will be heard at the Second Annual Convention of the National Plant Food Institute at The Greenbrier, White Sulphur Springs, West Virginia, June 10-13, 1956.

A record attendance of more than 1,000 persons is expected by officials of the Institute.

Senator J. W. Fulbright (D-Ark.), Chairman of the Senate Committee on Banking and Currency, and internationally-known in the field of foreign affairs, will be the principal speaker at the June 12 session.

A panel on Salesmanship will be featured at the opening session on Monday, June 11. The speakers will be: Dr. J. M. Bohlen and Dr. George B. Beal of Iowa State College, who will make a visual presentation of the results of an extensive survey on "Who Influences the Farmer," and Glenn R. Fouche, President of The Stayform Company, Chicago, who will speak on "Dramatize Your Selling."

John Ott of John Ott Pictures, Inc., Winnetka, Illinois, nationally-known motion picture producer and authority on time-lapse photography, will present a movie on "How Flowers Grow," especially for the ladies, on Monday, June 11, and a movie on "Seeing Plants Feed" will be presented to the general session on Tuesday, June 12.

Joseph A. Howell, President of the Institute, will preside at the sessions. He and other staff members will report to the membership on "One Year of Service to Our Industry" on June 11.

Other outstanding features at the June 12 session will include:

Showing of the Institute's new film, "What's In The Bag"—a motion picture featuring the technology of fertilizer production in a down-to-earth presentation.

Presentation of the "Soil Builders Award for Editors" winners of the Institute's annual contest sponsored with approval of the American Agricultural Editors' Association.

The annual business session of the Institute also will be held on June 12, at which officers will be elected and 12 members named to the Board of Directors. Meetings of the Board of Directors will be held on June 10 and on June 13.

A special program of recreation has been planned.

Safety Section at North Carolina Meet

As part of the statewide North Carolina safety conference and exhibit to be held at the Hotel Charlotte, Charlotte, N. C., the Fertilizer Section will hold a meeting the afternoon of May 3, under the chairmanship of W. M. Caldwell, Virginia-Carolina Chemical. A talk on accident prevention training for the employee is scheduled by Emil T. Chanlett, University of N.C.; American Mutual's Walter H. Smith will discuss safe handling of materials with emphasis on safe lifting; Wilford G. Jones of R. J. Reynolds will talk on a safety program that will work.

A discussion period will conclude the meeting.

Three-day Conference At Yakima, June 28-30

The Pacific Northwest Plant Food Association is staging its annual fertilizer conference at the Chinook Hotel. They inform us that reservations should be mailed direct to the hotel who, if they do not have what you want, will handle it with other hotels, motels etc. The conference runs all day Thursday and Friday with the banquet Thursday evening. Saturday morning the meeting will move out into the field where practical demonstrations of equipment and fertilizer placement will be held.

Georgia Society Has Active Program

The Georgia Plant Food Educational Society has set up for itself a busy May and July. May 17 will be the annual grazing awards banquet, which is to be held at the Georgia Terrace Hotel in Atlanta, and which usually brings together several hundred cattlemen, educational authorities and members of the fertilizer industry.

In July the annual summer fertilizer conferences will be held: Griffin, July 10; Athens, July 11; Tifton, July 13. J. Fielding Reed, American Potash Institute, 710 Mortgage Guarantee Bldg., Atlanta, is secretary-treasurer.

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- Constant, dependable supply due to completely integrated operation from forest trees to fine kraft Multi-Wall bags.
- Fast, reliable delivery assured by four strategically located plants:

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- Highest standards of quality assured by advanced research and control equipment.
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HAMMOND BAG & PAPER COMPANY, INC.

Division of Hudson Pulp & Paper Corp.

GENERAL OFFICES: WELLSBURG, W. VA.

Southwest Conference at Galveston, July 18-20

The Southwest Fertilizer Conference and Grade Meeting will be held July 18-20 at the Bucaneer Hotel, Galveston, Texas. Stanley Hackett, Dixie Fertilizer Co., Shreveport, La., is chairman of the program committee. Serving with him are W. S. Tyler, Longhorn Construction Co., Sulphur Springs, Texas; Don Miller, Armour Fertilizer, Houston, Texas; Harold Trammell, Farmers Fertilizer Co., Texarkana, Texas; Jack Lindsay, I.M.C., Shreveport.

Shell Radio Interviews Released

A series of four specially recorded interviews featuring case history reports on the use of aldrin to control rootworm on corn has been released by the Shell Chemical Corporation to selected radio stations in the Midwest, according to Mr. M. H. Keel, Advertising Manager, Agricultural Chemical Sales Division.

Don Lerch, Farm Reporter for Cornwell Inc., Washington, D. C., conducted the on-the-scenes observations on the use of aldrin to control rootworms.

Stone Mountain Granite Makes Trace-element Filler

A recent analysis of specimens of granite gneiss, found near Stone Mountain, Georgia's huge monolith, turned up the fact that it contained between 4.73% and 5.20% of potash, and a host of trace minerals, nineteen of them in all, many known to be important in unlocking problem soils and putting to work valuable nutrients in the soil otherwise unavailable to the plant.

Tested on Malabar Farm, during the life of the late Louis Bromfield, the conditioner brought from Mr. Bromfield a testimonial which reads:

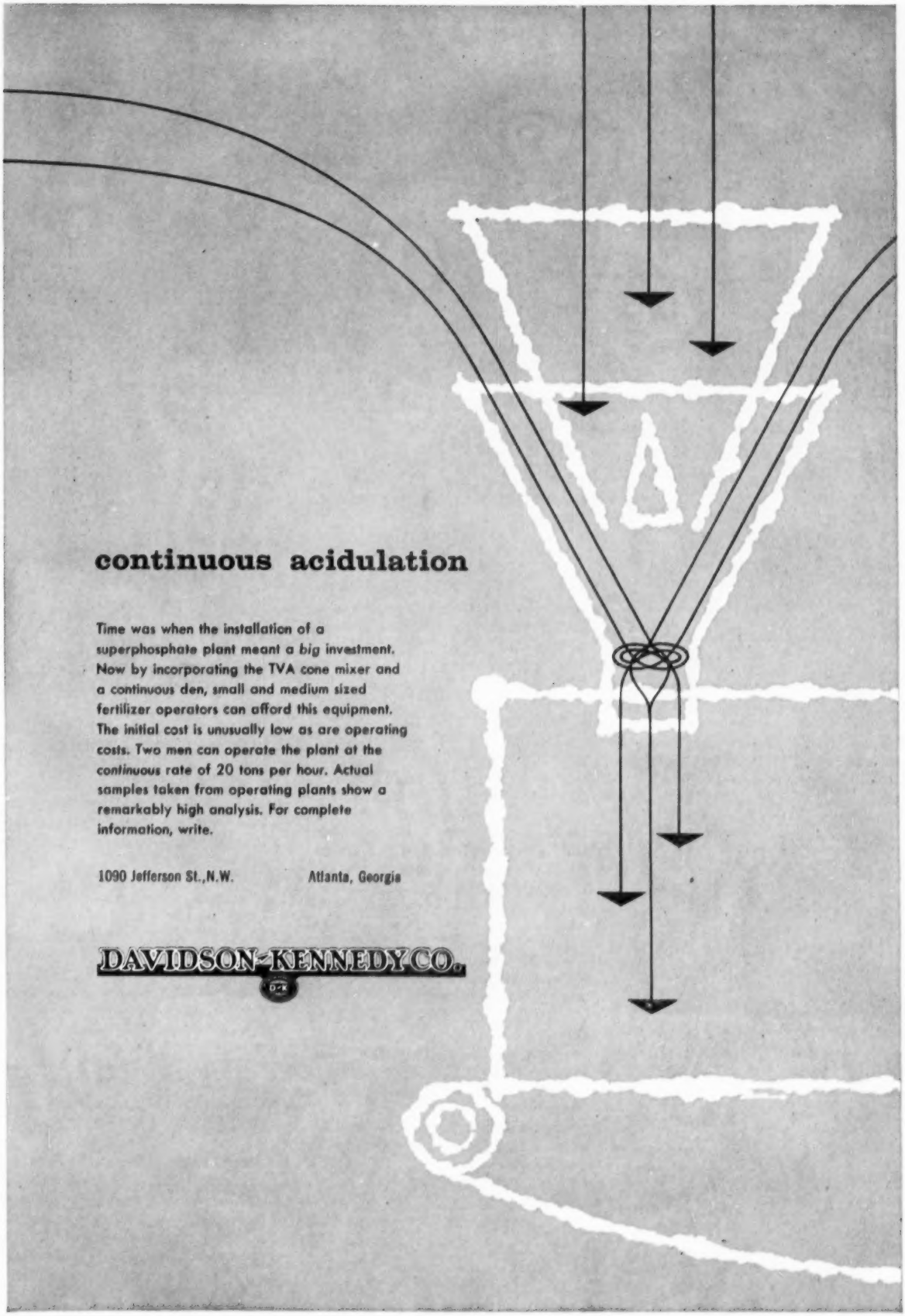
"There can be no argument from any point of view on the great value of Hybro-Tite; the only question is the degree of its benefits. At our own Malabar Farm, we have used it in various tests and in quantity in commercial agriculture practices, ranging from pastures and meadows to market gardening. In every case the benefits were evident and evident in a much shorter period of time than we had expected them to be. This was especially true in the case of quality produce for the vegetable market and in the case of hog pasture in a program of intensive low cost operation. There is evidence that the granite carries other elements beside potash, which are vital to the production of healthy and vigorous plants, animals and people."

Signed Louis Bromfield

The conditioner is now packed as Hi b Hybro-Tite Soil Conditioner, and is also sold as a trace-element fertilizer filler, by Potash Rock Co. of America, subsidiary of the well known Stone Mountain Grit Co., Lithonia, Georgia.

The product has been tested for lawn and garden use, and for pastures, fruits, vegetables, grains and tobacco with good response. Charlie Davidson, Sr., who heads the concern, says they make no definite claims for the product, because soils vary sharply. "But," he says, "when a soil analysis shows there is a lack of potash and trace minerals—try Hybro-Tite."

The product is pulverized in irregular particles, so that the smaller particles become available first and the process of rains and the interaction of soil chemicals makes the larger particles available to the plant roots.


continuous acidulation
Time was when the installation of a superphosphate plant meant a *big* investment. Now by incorporating the TVA cone mixer and a continuous den, small and medium sized fertilizer operators can afford this equipment. The initial cost is unusually low as are operating costs. Two men can operate the plant at the *continuous* rate of 20 tons per hour. Actual samples taken from operating plants show a remarkably high analysis. For complete information, write.
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Personals

George Tomlinson, who has joined the staff of Southern Lead Burning Company, Atlanta, in a sales service capacity. Formerly with Oklahoma Fertilizer Company as production manager, he has broad fertilizer industry background in managerial capacity.

Commercial Solvents Corporation, expanding its marketing and distribution organization for agricultural chemicals in the South, C. J. Watts, Jr., has been named Southeastern District Sales Manager and will make his headquarters in a new office located at 344 Williams Street, N. W., Atlanta, Georgia. The Southeastern District includes Alabama, Georgia, Florida, North and South Carolina.

Frederick W. Kiendl who has been appointed assistant manager of the Flexible Packing Division of Arkell & Smiths it was announced by Ernest H. Heath, sales manager. Mr. Kiendl has been in the packing field for over 5 years, and will continue to headquarter at Arkell and Smiths New York office at 500 Fifth Avenue.

Mack Drake, research professor of chemistry at the **University of Massachusetts,** was honored April 17 in New York City for his outstanding contribution to agricultural science. Presentation of a bronze medal and a $500 award was made to the Massachusetts scientist by **William H. Osborn** at the annual meeting of the **New York Farmers,** an association of industrialists and professional men who own farms and are actively interested in conservation and agricultural research. The award was made for his research on the chemistry of plant roots. His findings help explain the differences in the ability of plant species to absorb fertilizer elements from the soil.

* * *

Charles E. Wilson is retiring as chairman of the board of directors of **W. R. Grace & Co.** according to an announcement made last month jointly by Mr. Wilson and **J. Peter Grace,** president. The retirement will become effective on May 10th, date of the annual meeting of the stockholders of the company at which Mr. Wilson will preside.

The former chairman of the Defense Mobilization Board joined W. R. Grace & Co. as a director and consultant in 1952. Early in 1954 he was elected chairman of the Executive Committee and last year was named chairman of the Board. He was largely responsible for the integration of the company's newly acquired chemical interests.

* * *

E. F. Kindsvater of Bartlesville, Okla., was elected president of the **Farm Chemical Resources Development Corp.** at a recent meeting of the board of directors in Oklahoma City. The announcement was made by **James G. Patton, National Farmers Union** president and chairman of the corporation's board of directors.

The corporation was formed to mine and process potash on a 13,000-acre deposit in Lea and Eddy counties in southeast New Mexico. Mr. Kindsvater was formerly associated with **Phillips Petroleum Company.**

Jonathan C. Baker, formerly assistant traffic manager of the Cooperative G.L.F. Exchange, Buffalo, New York, has, per announcement of James E. Totman, president of Summers Fertilizer Company and Northern Chemical Industries, been appointed general traffic manager at the home office, Baltimore, Maryland. Mr. McDermott becomes manager of office sales of both companies at Baltimore. H. Wakefield McGorrill, formerly traffic business agent with the Boston & Maine Railroad, becomes assistant traffic manager.

* * *

Five promotions in rank were announced April 17 by **Vincent H. Shea,** president of **Shea Chemical Corp.,** Jeffersonville, Ind. Newest of the nation's phosphorus producers, the Shea firm is now undergoing major expansion programs in Tennessee and Texas.

The promotions are as follows: **E. P. Madsen** from vice president and controller, to senior vice president; **James D. Hogan,** from assistant to the president, to vice president; **J. B. Sutliffe,** from director of Industrial Sales, to vice president; **G. C. Taylor,** from assistant controller to controller; and **Vincent H. Shea, Jr.,** from sales coordinator and plant purchasing officer, Columbia, Tennessee, to general purchasing officer.

* * *

Stauffer Chemical Co. has announced the appointment of **Wayne Kincannon** as manager of the company's plant at North Little Rock, Ark. This plant manufactures pesticides, fungicides and other agricultural chemicals. Mr. Kincannon, who joined Stauffer last May, has previously been associated with the company's Lubbock, Texas operations.

* * *

Jasper D. Smith has swapped a phosphate mine for an easy chair, and says he's not sorry. For 40 years he was with **American Cyanamid**—nearly the entire period of their mining history—and he has gone from pit work to supervisor in the Brewster mine. War interrupted his mining twice. He rode a captive balloon in World War I, and was in the Coast Guard in World War II. And now, at 65, he's taking it easy at Lakeland, Florida.

* * *

Merrill Evans has been given the **V-C News** Newsmaker Award. He has been a V-C fertilizer salesman for 20 years, a State Legislator, a State Senator, a member of the N.C. State Highway Commission, and of the board of trustees of Eastern State Teachers College. And he is now a member of the Hertford

Here is a lightweight, portable, automatic performer that will handle any product that establishes an angle of repose. Typical examples: rice, sugar, corn, cracker meal, poultry feeds, granite grits, salt and dry chemicals.

Bemis Packer-Ette will reduce your costs through accuracy, speed and efficiency. It is just the packer for you in any operation that does not justify a heavy-duty, permanent installation.

Packer-Ette gives you so many benefits and features that it is impossible to do more than hit the high spots here. You'll want to get all the facts. Ask your Bemis Man . . . or write us for folder and details.

JUST LOOK . . .

SPEED—Up to eight 100-lb. bags per minute, depending on flow characteristics of your product.

ACCURACY—Plus or minus 2½ ounces or better on 100-lb. bags, depending on product characteristics. Self-aligning and self-cleaning knife edges of the scale assure consistent, accurate weights.

OPERATING EASE—The operator places an empty bag on the filling tube and starts the cycle by depressing the foot switch . . . that's all. The bag holder opens automatically when the filling cycle is complete. All controls are at eye level.

BEMIS VICON® FEEDER—A unique means of moving products from supply hopper to scale beam; a two-stage pulsating feeder tray first feeds rapidly, then at a rate which can be controlled for accuracy. When the exact weight is reached, the feeder cuts off and the filled bag is deposited automatically on the sewing machine conveyor.

CAPACITIES—From 25 lbs. to 150 lbs. Easily adjustable for varying bag sizes.

TAKES LIMITED SPACE—Width, 26"; depth, 42"; maximum over-all height, 97⅝"; minimum, 76".

LIGHT AND PORTABLE—Shipping weight, 600 lbs. Portable mounting for use in various locations.

NO INSTALLATION SERVICE—Just move it in and plug into a 110-volt, 60-cycle line. All electrical equipment enclosed in cast-iron explosion-proof boxes.

At last . . . big packer performance at little packer price . . .

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Dr. M. S. Williams, Specialist in Charge, Extension Farm Management and Marketing at North Carolina State College since 1954, who will become Chief Economist of the National Plant Food Institute, beginning July 1, Dr. Russell Coleman, Executive Vice President of the Institute has announced. As Chief Economist for the Institute, Dr. Williams will develop programs designed to focus attention on the economic value of using fertilizers properly. "We are pleased that Dr. Williams is joining our staff for we recognize the need for closer cooperation with the Nation's agricultural economists, particularly at the land-grant college level, in emphasizing the economic research values of plant foods in relation to the other major factors entering into a sound land management program," Dr. Coleman said.

James S. Greene, assistant agronomist for the National Plant Food Institute, will leave the organization April 20 to join Ashcraft-Wilkinson Company as its sales representative in Minnesota, Iowa and Missouri. Greene, who has been associated with the former National Fertilizer Association and the National Plant Food Institute since October 1954, will be headquartered in Des Moines, Iowa.

County Board of Commissioners. He certainly deserves that Award!

* * *

L. J. Nicholson has been made manager of the $1,000,000 fertilizer storage plant being built by **Cominco Products** at Trentwood, Wash.

* * *

Robert P. Langguth of Dayton, Ohio, has been promoted to group leader and will direct activities of the food laboratory of **Monsanto Chemical Company's** inorganic chemicals division research department at Dayton. Since he joined Monsanto in 1952, much of his work has been in connection with the development of liquid fertilizers and in the use of phosphoric acid for various fertilizer applications.

* * *

Richard G. Glover has become a member of the engineering and development staff of **Monsanto Chemical Company's** inorganic chemicals division at St. Louis, where he will coordinate various phases of engineering, production and sales of sulfuric acid, as well as of other heavy chemicals.

Mr. Glover has for the past 13 years been with the General Chemical Division of **Allied Chemical and Dye.**

* * *

A realignment of the Western sales department of **American Potash & Chemical Corporation** has been announced by **William M. Clines,** Western sales manager.

Ralph Hoh, formerly supervisor of soda ash sales, has been named manager of soda ash sales, to handle the company's expanded production of the product.

Trevor Steele, formerly Pacific Northwest regional agronomist for the company, has been transferred to agricultural chemicals sales, reporting to **Paul F. Staub,** Pacific Northwest district sales manager.

Frank McGrane has been named manager of Western potash sales to fill the post previously handled by **Rod Taft,** recently transferred to San Francisco as district sales manager. Mr. McGrane joined the company last September in the sales department's general staff.

Daniel A. Lundy will continue in charge of Western sales of boron products, lithium products and bromine.

Parker S. Dunn, vice president, manufacturing, of **American Potash & Chemical,** has announced the appointment of **Henry S. Curtis** as plant manager of the company's Henderson, Nev., subsidiary, **American Potash & Chemical Corporation (Nevada).**

Mr. Curtis comes to American Potash & Chemical from **Monsanto** at Texas City where he was administrative assistant to the head of the engineering department.

Dr. Thomas W. Clapper has been appointed associate director of research for **American Potash & Chemical** to head research facilities at the company's Henderson, Nev., plant, it was announced by **Joseph C. Schumacher,** director of research. He comes to American Potash & Chemical Corporation from Chemical Construction Company.

* * *

William Bellano has been appointed to the newly created position of director, mining & minerals exploration, **International Minerals & Chemical Corporation,** according to **T. M. Ware,** administrative vice president.

* * *

Raymond L. Howerton, Hyster Company, industrial truck and tractor equipment manufacturer, has been promoted to the position of assistant manager, sales promotion department, according to an announcement by Dar Johnson, Hyster sales promotion department manager.

* * *

The addition of five men to the technical service and sales staff of the agricultural chemicals division, of **Hercules Powder Company,** was announced by **Richard T. Yates,** manager of the division. At the same time, Mr. Yates announced the establishment of a new sales office in Greenville, Mississippi, under the direction of Mr. Leonard V. Edwards, who was formerly located at Hercules' Dallas Office.

The five additional men have been assigned as follows:

Arthur A. Chadwick, technical assistant, advertising department, Wilmington, Delaware.

Marvin H. Frost, Jr., technical service representative, Los Angeles, California.

Richard D. Griffith, technical service representative, Greenville, Mississippi.

Ernesto J. Groskorth, technical service representative, Export Department, San Salvador, El Salvador.

Thomas J. Walker, Jr., technical service representative, Wilmington, Delaware.

* * *

J. R. Clements has been appointed vice-president and general sales manager of the **Raymond Bag Corporation,** according to an announcement by **F. D. Gottwald,** president of **The Albemarle Paper Manufacturing Company** of Richmond, Virginia, parent company of Raymond. Mr. Clements was formerly General Sales Manager of the Multiwall Bag Division of Albemarle.

* * *

The appointments of **Horace W. Boynton** and **W. Mayo Smith, Jr.,** as assistant directors of Research for **Escambia Bay Chemical Corporation** have been announced by **Dr. N. C. Robertson,** director of research.

Mr. Boynton will be in charge of engineering and of fertilizer research, and comes to Escambia from North American Cyanamid Ltd. where he was in charge of development at their Welland plant.

Dr. Smith will be in charge of polymerization and plastics research and development. Escambia Bay's research and pilot plant work is now being conducted in Cam-

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Best proof of Trona's versatility is the depth of Trona's services and ever-increasing demand for Trona products.

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Greater productivity at Searles Lake, the new plant of American Lithium Chemicals, Inc., and acquisition of Western Electrochemicals, all attest to progress and growth.

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Trona is a pioneer and leader in a long-range research and development program for lithium and boron chemicals in its Whittier (Calif.) Research Laboratory.

ONE OF THE WORLD'S MOST DIVERSIFIED SOURCES OF BASIC CHEMICALS VITAL TO INDUSTRY AND AGRICULTURE

TRONA

American Potash & Chemical Corporation

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Plants · Trona and Los Angeles, California
· San Antonio, Texas *(American Lithium Chemicals, Inc.)*
· Henderson, Nevada
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Producers of: **BORAX • POTASH • SODA ASH • SALT CAKE • LITHIUM • BROMINE • CHLORATES • PERCHLORATES • MANGANESE DIOXIDE and a diversified line of specialized agricultural and refrigerant chemicals.**

bridge and Newton, Massachusetts.

A new plant was recently dedicated at Pensacola, Florida, for production of ammonia, ammonium nitrate and fertilizer solutions.

* * *

F. L. Munger, vice-president and sales manager of **Kraft Bag Corporation,** announces that **Ed Burgers, Jr.,** formerly sales representative in the St. Louis area, has been appointed sales promotion manager, with headquarters at 630 Fifth Avenue, New York.

* * *

The Hayes-Sammons Company, Mission, Texas, announces the appointment of **Larry E. Franks, Jr.,** to their staff. He was formerly the agricultural agent for Willacy County. 4-H Club boys trained by Mr. Franks have won first place in either the dryland or irrigated divisions of the Valley Farm Bureau cotton contest each year for the last four years. Willacy County 4-H Clubbers have also taken top honors in the fat calf division of the Rio Grande Valley Livestock show for the past four years.

* * *

Two field representatives of **TVA's** fertilizer distribution branch, division of agricultural relations, now reside out in the territories that they serve. **L. Page Johnson** is headquartered at Little Rock, Arkansas, and **John E. Wiley** is located at St. Paul, Minnesota. Both men formerly worked out of Knoxville, Tennessee.

Herbert B. Davis, who has joined Southern Nitrogen as sales representative for South Carolina. He was the second president of the S. C. Plant Food Educational Society, and inventor of the "DID" injection nozzle which led to more uniform ammoniation and more nitrogen from solutions. He will continue to headquarter at Columbia.

Johnson's territory will be Arkansas, Kansas, Louisiana, Nebraska, Oklahoma and Texas. Wiley's area will consist of Minnesota, North Dakota, South Dakota and Wisconsin.

* * *

Union Bag & Paper Corporation has announced the following changes in the multiwall bag division:

W. W. Dipman, formerly Northeastern district sales manager, has been appointed assistant to **S. K. Bradley,** vice president in charge of bag and paper sales.

W. S. Eldredge has been appointed Northeastern district sales manager. He was formerly a multiwall sales representative.

R. B. Bennett has been appointed Southeastern district sales manager. He has served previously as eastern district sales manager of the company's flexible packaging division.

W. A. Molzahn has been appointed Southwestern district sales manager with headquarters in Kansas City. He was formerly a multiwall sales representative.

B. J. O'Hearn has been appointed district manager of the Denver area and will headquarter in that city. He was formerly southwestern district sales manager.

J. C. Bauman, formerly multiwall sales representative in the Georgia-Florida area, transfers to the New York office and will cover the New Jersey and Pennsylvania sales territory formerly handled by Mr. Eldredge.

M. Turner, takes over Mr. Bauman's sales territory and will headquarter in Jacksonville, Florida. He served previously in the company's package engineering department.

E. N. Corrent moves from the Denver area to the New York office. He will cover the metropolitan New York sales territory formerly handled by Mr. Molzahn.

* * *

Continental Gin has consolidated its special products division and the industrial division. The merged division will be known as the industrial division and will be under the direction of **George C. Morgan.** Former manager of the industrial division, **Ralph Y. MacIntyre** has been made manager of the new sales development department.

CF Staff-Compiled TONNAGE REPORTS

FERTILIZER TONNAGE REPORT (in equivalent short tons) Compiled by COMMERCIAL FERTILIZER Staff

State	February		January	Oct.-Nov.-Dec. Quar.		July thru Dec.		Jan. thru June		Year (July-June)	
	1956	1955	1956	1955	1954	1955	1954	1955	1954	1954-55	1953-54
Alabama	.....	315,766[1]	22,494	105,375	183,470	167,372	272,068	844,071	924,968	1,114,238	1,074,892
Arkansas	.....	81,579[1]	15,229	26,732	16,471	60,294	59,887	270,894	313,787	330,776	366,225
Georgia	133,176	181,966	41,187	170,229	161,692	250,968	225,083	1,047,875	1,147,157	1,273,445	1,361,254
Kentucky	.....	.....	55,413	58,090	52,928	88,119	91,386	431,024	489,024	524,488	577,929
Louisiana	.....	85,771[1]	12,716	36,496	42,679	59,345	78,067	1,047,875	250,747	310,848	325,218
Missouri	.....	120,206[1]	33,953	192,620	120,579	360,211	268,257	394,979	500,020	682,690	756,457
N. Carolina	.....	514,314[1]	86,554	163,008	193,088	225,182	264,475	1,566,158	1,558,472	1,830,633	1,815,572
Oklahoma	.....	17,212[1]	1,944	29,195	28,205	69,542	58,406	63,799	72,802	122,305	144,367
S. Carolina	286,994	327,676	41,629	78,592	92,182	119,947	132,604	791,206	752,639	928,715	936,558
Tennessee	33,783	47,929	3,399	77,805	114,771	136,925	167,383	282,452	405,756	523,349	523,303
Texas	101,164	120,936	27,459	112,453	149,708	193,704	212,885	371,587	374,309	584,269	560,381
California (reports submitted quarterly)				188,204	176,395	361,615	318,270	603,857	513,300	922,127	830,327
Virginia (reports submitted quarterly)				.....	81,126[1]	.....	159,185[1]	636,585	620,261	795,770	780,931
Indiana (reports submitted semi-annually)						242,530	284,994	873,966	896,104	1,158,960	1,180,091
New Jersey (reports submitted semi-annually)						.....	53,830[1]	.....	231,686[1]	.....	289,614[1]
Washington (reports submitted semi-annually)						48,749	58,162	124,186	101,799	182,348[1]	*
TOTAL	555,117	678,507	341,997	1,238,799	1,332,168	2,334,503	2,486,900	8,535,430	8,921,132	11,102,613	11,233,505

..... (not yet reported) * Not compiled [1] Omitted from column total to allow comparison with some period of current year.

MARKETS

ORGANICS: There has been recently, increased activity in the fertilizer organic market as a result of announcement of prices on Nitrogenous tankage by some of the major producers. One producer has sold heavy quantities for summer shipment at $2.75 per unit of Ammonia, bulk, f.o.b. Midwestern production point. For September/forward the price is $3.00 and for January/forward $3.25 for the same production.

There is good probability these prices may be revised upward in the very near future in view of heavy sales at these prices. Sewage Sludge continues in fairly tight supply and the price is currently $2.95 per unit of Ammonia and 50c per unit APA, bulk, to $3.00 per unit of Nitrogen and 50c per unit APA, f.o.b. shipping point, depending on the location of the production.

CASTOR POMACE: Imports of Castor Bean continue at very low levels and the production of Castor Pomace is quite reduced. Supplies where available at $40.00 per ton, bagged, f.o.b. Northeastern production points. Producers will not offer shipment beyond May 31st.

DRIED BLOOD: Prices in the Chicago and New York area are around $4.75 per unit of Ammonia for Unground sacked Blood.

POTASH: Because of bad weather conditions in various parts of the East and South, demand is somewhat behind for this time of year as a result of delayed planting.

GROUND COTTON BUR ASH: Demand continues excellent for this source of Potash which is primarily in the form of Carbonate of Potash. Supplies are available for shipment prompt through June. Current analyses vary from 38% to 42% K20 which makes for a delivered cost approximately that of Domestic Sulphate of Potash.

SUPERPHOSPHATE: Triple Superphosphate is moving in good volume, but the delayed season in many parts of the country has affected the movement. Prices remain steady. Normal Superphosphate demand currently is in fair volume and prices steady.

PHOSPHATE ROCK: Weather conditions affecting the movement of fertilizers correspondingly has affected the Phosphate Rock movement from the mines. Prices continue stable and movement in fair volume.

NITRATE OF SODA: Shipments are currently at a seasonal level with demand expected to increase during May and June for side dressing. Prices remain steady.

SULPHATE OF AMMONIA: Stocks continue at high levels and it is reported that on the West coast price declined $3.00 per ton down to $46.00 current price. The Eastern market is steady at $42.00 per ton.

GENERAL: Heavy rains in the deep South and freak wind and cold weather along the Atlantic Seaboard has caused replanting of crops and the general delay in the fertilizer season. Over all demand for fertilizers possibly could be less for the entire season than last season because of these unfavorable weather conditions.

OBITUARIES

Emil G. Buchsieb, 74, founder of E. G. Buchsieb Inc., died March 27 in a hospital in Columbus, O.

Dr. Edward A. Colman, 45, soil scientist, chief of watershed management for the US Forest Service, died March 20 in San Francisco.

John Henry Mueller, 78, board chairman of Private Brands, Inc., crop chemicals, died March 20 after a stroke suffered in February.

Frederic H. Tunnell, 70, board chairman of F. W. Tunnell and Co., Inc., Philadelphia, died in Florida March 26.

James Barney Vickery, 69, for 20 years with Furman Fertilizer, East Point, Ga., and prior to that with Atlanta Utility Works, died April 18 of a heart attack.

Albert R. West, 60, an owner of Tryco Mfg. Co., and Nitrogen Solutions Inc., Decatur, Ill., died March 7 in a hospital at Hayti, Mo.

INDUSTRY CALENDAR

Date	Organization	Place	City
June 10-13	Nat'l. Plant Food Inst.	Greenbrier	White Sulphur
June 28-30	Sou. Control Officials	Roanoke	Roanoke, Va.
June 28-30	Pacific N.W. Plant Food	Chinook	Yakima, Wash.
June 30	Del-Mar-Va Peninsula	Geo. Washington	Ocean City, Md.
July 18-20	S.W. Grade Hearings	Bucaneer	Galveston, Tex.
July 4-8	E. Canada Plant Food Prod.	Mt. Tremblant Lodge	Mt. Tremblant, Q.
Oct. 19	Control Officials Assn.	Shoreham	Washington, D. C.
Nov. 11-13	Calif. Fert. Assn.	Coronado	Coronado, Cal.

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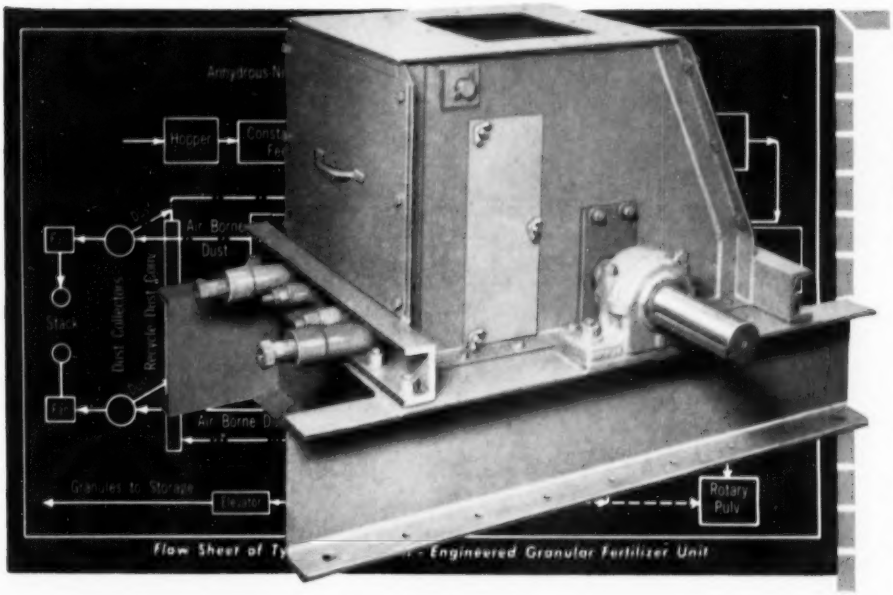

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CROPS CHEMICALS

We believe our readers will find interesting the following story from the El Paso (Texas) Times. Interesting because it advocates what seems to us a smart use of crop chemicals to prevent infestation rather than wait to eradicate it, and because the man involved has a sound background of agricultural experience, and knows what he's talking about.

A PRACTICAL FARMER—AND CROP CHEMICALS

W. T. (Ted) Sharp, who relies on practical experience to combat agricultural troubles, has some definite ideas on what El Paso Valley farmers should do during the 1956 farm season.

Sharp, who has been farming near Tornillo for almost 25 years, believes the pink bollworm will be a definite threat to cotton production in this area this year.

"Unless we get the jump on the bollworm we may be in for a lot of trouble," Sharp believes.

Last year, Sharp tried something new in combatting insects. He believes it may work against the bollworm. It is "preventative poisoning."

"I didn't wait until I found bugs in the cotton. I poisoned before they arrived and kept up light treatments throughout the season," he said.

The results speak for themselves. Sharp had one of his best crops and had no trouble from the bugs, which plagued many valley farmers.

He harvested 250 bales of short staple cotton from 104 acres and had 70 bales of long staple on 44 acres.

"And that long staple was weighed out in 500-pound bales," he said.

Sharp started his poisoning in mid-June, using a tractor blower to spread an insecticide dust. Most of the poison was obtained from Southwest Fertilizer and Chemical Co.

After the initial dusting Sharp and his workers sprayed a block or two of rows each night, averaging only about five pounds of dust to the acre.

ECONOMICAL

Sharp found the tractor dusting an economical and practical method of spreading the poison. There was no delay because of untimely winds because most of the dusting was done at night when the breezes were slight.

Sharp thought of the preventative poisoning after a heavy bug infestation in 1954.

"I didn't want to have that trouble again. Eeveryone knows that we get the bugs when the rains come about July. Last year I just decided to poison before the rains," he said.

Sharp also is economical about irrigating when there's enough water.

"I don't try to drown the cotton. When there is plenty of water, some farmers use too much. If they used less they'd be better off," he said.

He believes that lining of river and ditches from Elephant Butte is "impractical" now.

"If they did it when they first built the dam it would have been all right but it's too expensive a proposition now," he said.

DRAWS CONCLUSION

He also believes the seepage is helping recharge underground water supplies and that past seepage is responsible for the good water level in most parts of the Valley.

Sharp's ideas on preventative poisoning bring wholehearted agreement from officials of Southwest Fertilizer. They agree that many times it's too late to poison bugs when they already are in the fields. A "bug check" usually works well but often times the bugs have multiplied so rapidly before discovery that they do damage before they can be controlled.

"Early and light poisoning and continuous light poisoning throughout the season costs no more than heavy poisoning once the bugs are discovered," officials believe.

Born in Central Texas, Sharp worked for many years for the U. S. Reclamation service, both in the El Paso area and in the Yuma Valley. He settled permanently in the Lower Valley in 1921.

Married, he and his wife have three children. Ted Jr., lives in Fabens and works with his father; Harold works for El Paso Natural Gas, while a daughter, Mrs. Norman Faye Brown, is a nurse in Las Cruces, N. M.

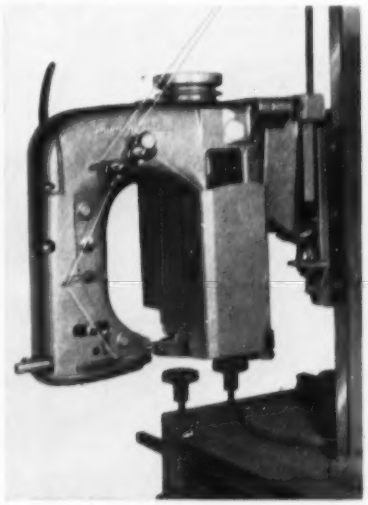
"I've read all the pamphlets on farming that I can find but the best teacher is experience," Sharp said.

New Bag Closing Heads From Union Special

Union Special Machine Co. has announced development of a new class of bag machine sewing heads —Class 53600.

These new units are complete and direct replacements for the older Class 14500 machines and are designed for closing light to heavy weight cotton, burlap, and osnaburg bags, and one- to three- ply paper bags. All units in the new class are single-needle, high throw machines, and incorporate numerous improvements and new features which promise to make them the most outstanding new development in modern bag closing machines.

Of great interest to packers is the increase in speed available on these new machines. Rated speed has been increased 50 per cent which means added sewing capacity in the head, and conveyors can be synchronized with the sewing machine speed for greater production and profits, less strain on operator and machine.



An enclosed automatic lubrication system that is fed by two external reservoirs brings machine maintenance and oiling problems to a new low. By gravity and capillary action, oil is fed through the bored base of the bed to the main bearings, crankshaft, and all other driving eccentrics by the two reservoirs mounted externally on the casting.

All units in Class 53600 are equipped with such special features as chain cutter, throw-out looper device to facilitate threading the looper, and tiltable feed dog, which allows the front or rear section of the feed to be raised or lowered, to suit feeding requirements. The feed lift, looper avoid, and chain cutting knife are driven through eccentric strap linkage, rather than by the cam-fork arrangement incorporated in the older Class 14500 machines. The looper and needle drives are of the ball and strap type.

Class 53600 machines are built on a modified streamlined flat bed frame which has a somewhat shorter base than standard. The left end of the base is ⅞ inch from the needle, which allows the bag to be brought in close for a Snug-Tight closure. The distance from the center line of the needle to the lower edge of the throat plate support is ⅝ inch.

For particular production requirements, seven individual styles of machines are available in the new Class 53600. They include three units for mounting on auxiliary bag machines, and four suspended head units with variations of counterweight or top lock balancer.

Complete information can be obtained from Union Special Machine Co., 400 N. Franklin St., Chicago 10, Ill.

Members of the safety committee of the Norfolk plant of Smith-Douglass Co., Inc., admire the President's Safety Trophy, presented in recognition of the plant's outstanding safety record during 1955. The President's Safety Trophy, a traveling award, is presented to the plant with the best safety record for the year among 11 competing Smith-Douglass plants. Presentation of the award to the Norfolk plant marked the second consecutive year that operation was the safest Smith-Douglass activity.

BOOKS

APPROVED PRACTICES IN PASTURE MANAGEMENT. By M. H. McVickar, Ph. D., Chief Agronomist for California Spray-Chemical Corporation, and formerly in charge of Agronomic Education for the National Plant Food Institute. Published by The Interstate, Danville, Illinois, 1956. 256 pages. Illustrated. Price: $2.40.

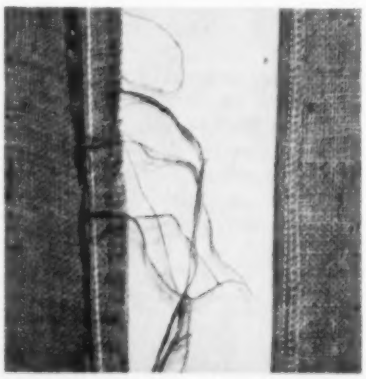
This "how to do it" book covers the important activities associated with establishment, management, and efficient use of pastures as grazing lands or as a source of fine winter feed for livestock. Information in the book is as specific as possible for all U. S. pasture areas.

At the beginning of each of the 20 chapters is a list of activities involving the approved practices discussed in that chapter. Because of the author's wide experience in the use of fertilizers on crops and his close knowledge of the fertilizer industry, the book contains the latest information on the best use of plant food in all phases of pasture and forage production.

Institute Releases Colorful Potash Book

A well illustrated pocket-size book, entitled "Potash in Agriculture" has been released by American Potash Institute which compresses into 30 pages a wealth of information on the subject.

A larger model "HO" "PAYLOADER" tractor-shovel with numerous new features has just been announced by The Frank G. Hough Co. of Libertyville, Illinois. This new unit has a heaped capacity of 2-1/4 cubic yards and a struck capacity of 1-3/4 cubic yards. In addition to a complete "no-stop" power-shift transmission and torque converter, these new units are equipped with planetary axels and torque-proportioning differentials, which combat wheel slipping. When the wheel on one side encounters poor tractive conditions and tends to slip, the torque-proportioning differential automatically delivers more power to the opposite wheel.



A new overstitched side seam for burlap bags, which eliminates raveling of loose weft yarns on the cut edges of the burlap, has been perfected and introduced by Bemis Bro. Bag Company. This seam, called "Edge-Lock" by the company, is the first basic improvement in burlap bag side seams in many years. Loose weft yarns coming loose and mingling with the product packed has long been a problem with burlap bag users, and has become increasingly so with the growing trend toward automatic feeders, automatic seed planters, and other mechanized farm operations. Numerous reports from the East, where the Bemis Edge-Lock seam bags have been extensively tested in recent months, indicate that the bag completely eliminates the loose weft yarn problem.

(*Continued from page 26*)

the material of higher solubility would decrease the manufacturer's profit by 15 per cent.

Two formulations for 12-12-12 are shown in Table IV. Since 12-12-12 derives a large proportion of its P_2O_5 from triple superphosphate, the water solubility is higher than in 10-10-10 even when both are ammoniated to the maximum practical degree. In the first formulation the degree of ammoniation is about as high as is practical; the water solubility is about 50 per cent. In the second formulation the degree of ammoniation has been decreased by deriving less nitrogen from ammoniating solution and more from ammonium sulfate. In order to make room in the formulation for the ammonium sulfate, it is necessary to derive a higher percentage of the P_2O_5 from triple superphosphate. The water solubility of this formulation is 75 per cent; it cost about $4.20 per ton more to produce than the 50 per cent solubility product. The manufacturer's profit would be about 30 per cent less.

Comparison of Table III and IV shows that a 12-12-12 of 50 per cent water solubility costs about the same per unit of plant food as a 10-10-10 of 23 per cent solubility.

Conclusions

When mixed fertilizers are produced by conventional methods, the water solubility depends on the degree of ammoniation and on the type of superphosphate (ordinary or triple).

Higher analysis fertilizers in which most of the P_2O_5 is derived from triple superphosphate have a higher percentage of P_2O_5 in a water-soluble form than lower analysis materials in which most of the P_2O_5 is derived from ordinary superphosphate when both are fully ammoniated.

Increasing the water solubility of a given grade usually increases the manufacturing cost; the increased cost may be a small percentage of the selling price, but it may decrease the manufacturer's profit by a relatively large percentage.

In many cases, increasing the grade may be an economical means of increasing the water solubility.

At present, manufacturers have little incentive for increasing the solubility of P_2O_5 in fertilizers, and few manufacturers know the solubilities of their products. Some means of recognition of the value of water solubility will be required to induce manufacturers to produce materials of high solubility or to determine solubility of their products.

REFERENCES

1. A.O.A.C. "Methods of Analysis," 8th edition, p. 10 (1955).
2. Clark, K. G., and Hoffman, W. M., **Farm Chemicals**, pp. 17-23 (May 1952).
3. Hein, L. B., Hicks, G. C., Silverberg, J., and Seatz, L. F. "Granulation of High Analysis Fertilizers." (Paper presented at the 128th meeting of The American Chemical Society, September 1955.
4. Pesek, John T., "Economic Interpretation of the Importance of Water Solubility in Phosphorus Fertilizers When Used as Row Fertilizer for Corn." (Paper presented at Seminars for Cooperators in the TVA Agricultural Economics Research Activities, March 1956.

Seminars for TVA Cooperators Study Ag-Economics Problems

CF Staff Photos Above—

Top: Harold G. Walkup and E. L. Baum of TVA. **Center:** Norman Nybroten, Univ. of W. Va.; John D. Black, Harvard Univ.; and T. W. Schultz, Univ. of Chicago. **Bottom:** Earl O. Heady, Iowa State Coll., and William H. Nicholls, Vanderbilt Univ.

Four days of round-the-clock sessions attracted a big crowd of agronomists, chemists and economists from eastern and central sections of the nation to Knoxville, Tenn., March 27-30 to participate in the Seminars for Cooperators in the TVA Agricultural Economics Research Activities. Sponsored by Tennessee Valley Authority's Division of Agricultural Relations, the meeting heard papers from some of the country's top research and analysis teams, along with new data from the laboratories and pilot plant operations at TVA.

While some preliminary reports dealt with incomplete work-in-progress, others were conclusive and offered facts with which today's management decisions can be improved.

One of the studies of high interest-value to the fertilizer industry appears on page 23 in this issue of Commercial Fertilizer. Others are scheduled for publication in subsequent issues.

TVA photos—Upper left: Leland G. Allbaugh, director of TVA's Agricultural Relations Division; John E. Ewing, Univ. of Tenn.; John D. Black, Harvard Univ. **Lower left:** Joseph Ackerman, Farm Foundation; Glenn L. Johnson, L. S. Robertson, Jr., and J. F. Davis, all from Michigan State Univ. **Upper right:** Gilbert L. Terman and T. P. Hignett of TVA; John T. Pesek of Iowa State Coll.; and George Stanford, TVA. **Right center:** John N. Mahan, Sheiden L. Clement, H. G. Walkup and Z. A. Stanfield, all with TVA. **Lower right:** Martin E. Weeks, assistant director of TVA's Agricultural Relations Division, and William H. Nicholls of Vanderbilt Univ.

RESEARCH RESULTS & REPORTS

Fertilized tequila is just one of the strange things that seems to be happening lately. From Mexico City comes word that the nation's largest tequila brewery is feeding its 6,000,000 maguey plants with a special nitrogen-potassium blend. And they say it has boosted production 20%, bringing the plants to maturity 10 to 12 years earlier. We had no idea a Mexican could be that patient, awaiting his joy juice.

• • •

Fish analysis fertilizer—containing the same elements as are contained in the body of the salmon—turns out to do a wonderful job of increasing the plankton populations. And as plankton grow up to be salmon, and salmon grow up to be canned—you can see how important this may be. All this is official from the Fish and Wildlife Service.

• • •

Volcanic ash is being readied to go into fertilizer and to be used for polishing the family silver, too, according to a report we have here from Oklahoma. There the Stay-Ready Laboratories (who should borrow the Boy Scout motto "Be Prepared") a division of Salyer Refining Co., are digging up this fine white ash, and stay ready to package it. Among other things they mix it with nitrogen and pelletize it.

• • •

Whale cooking is the start of a plant stimulant and soil conditioner which we hear about from Canada. Acme Peat Products of Vancouver cook out the whale solubles, mix them with peat moss — and they have a product called Blue Whale which has been highly praised by the American Primrose Society, of all things.

James Watson, who runs this whale-cookery, saves out the liver because that has vitamins in it which go a different nutritive route. The whale stew is pressed, made into a fine powder. The peat moss is powdered, too. The process is patented . . . Number 2,738,264.

• • •

Wet-Dry fertilizer is another new thing. This comes out of Cleveland, O., where three business men have developed a way of spraying both dry and soluble fertilizer on lawns at the same time. The fertilizer is the urea-formaldehyde formula . . . Nitroform. Sounds complicated, but the groundskeeper for the Cleveland Indians tried it and it works fine.

• • •

Silicone seed treatment is being advocated by the New York AES at Cornell for pea seeds. They say the use of chemical protectants is a must for pea growing in New York, and the silicone overcomes interfacial friction between chemically treated pea seed, without reducing the effectiveness of the coating.

• • •

Termite privacy is being invaded in Los Angeles where the University of California has developed a listening device which hears the termite chewing. Virgil E. Strong, executive secretary of the California Pest Control Association has tested the gadget and says it's "really great." In the earphones termites munching sound like the popcorn noise of a Saturday afternoon movie audience.

• • •

Protein control by way of fertilizer is something new to us which has been perfected by one Dave Wainer, who runs a very successful farm known as Dave's River Bottom Ranch, in Brooks County, Georgia. Dave does everything differently from other people, but he has 1550 acres of land for which he paid $8 per acre in 1942, and it is valued now at about $100 per acre. The grass Dave grows is controlled as to protein content by regulating the nitrogen applications he puts on it. And that's just a sample of Wainer's ways.

• • •

Phooey on worms says Dr. Milton A. Miller of the University of California's Davis campus. He says they are fine for fishing but a farmer gets more for his money out of fertilizer. Worms are ok. They enrich it with earthworm manure; they improve its texture . . . but if you have to buy something, buy fertilizer.

New Bemis Bro. Bag Company in Flemington, N. J., for the manufacture of waterproof paper-lined laminated textile bags and burlap bags which went into operation last month. Floor area of the plant is 30,000 square feet.

Buflovak Division Introduces New Mixer

Where quick, thorough mixing of dry products is a processing problem, the new Nauta Mixer, just introduced by Buflovak Equipment Division, Blaw-Knox Company, will provide a new answer to shortened mixing time cycles and increased production, according to the manufacturer.

The exclusive feature of the Nauta is its unique action which permits uniform mixing of any number of other materials, similar or entirely different in characteristics, without dusting or particle modification.

Processional motion around the interior wall of a stationary conical body by a revolving screw flight gives both top-to-bottom and circular blending.

This unique feature enables processors to blend small quantities with large volumes; to add small amounts of liquid to dry materials. It can be used to dissolve solids in a liquid media.

The stationary body of the mixer provides the utmost in safety because there are no external moving parts. The Nauta may be jacketed for cooling or heating products during blending. The unit can also be equipped for automatic charging. Discharge of materials is at the bottom. Discharging can be accelerated by reversing the screw flight.

The Buflovak Equipment Division is the exclusive licensee for the Nauta Mixer. It is manufactured in laboratory, pilot plant and full production models.

The Nauta Mixer is available in the Buflovak Research Laboratory for materials testing. Literature on the new mixer is available upon request to Buflovak Equipment Division, Blaw-Knox Company, 1543 Fillmore Avenue, Buffalo 11, N. Y. Ask for Catalog No. 371.

Link-Belt Car Unloader Uses Oscillating Motion

Oscillating motion is now being utilized by Link-Belt Company to empty free-flowing bulk materials from railroad boxcars at the rate of four car loads per hour.

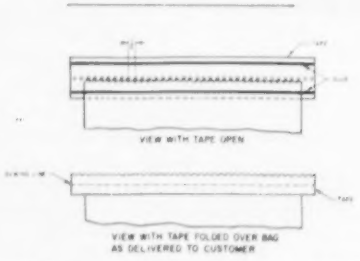
A new unit, known as the Kar-Flo, takes a standard railroad boxcar weighing up to 150,000 lbs. loaded, locks it in its grasp on a steel structure, and then, by means of a gentle oscillating, or rocking, motion of only three inches at the ends of the car empties the load. The car is not injured by this operation.

The visible portion consists of a pair of rails mounted on a platform next to the receiving hopper, and an operator's platform with control center. The rail furthest from the operator's platform is eight inches higher than the nearer rail. This produces the necessary eight-degree side tilt toward the receiving hopper. The approach rails slope gradually and approximate the bank of a standard railroad curve.

Folder 2645, just published by the manufacturer uses pictures and drawings to explain how this entirely new concept in boxcar unloading operates. For a copy of Folder 2645, write to Link-Belt Company, Dept. PR, Prudential Plaza, Chicago 1, Ill.

Brochure On Aqua Ammonia Converters

A new brochure has been prepared by J. C. Carlile Corporation on a full line of aqua ammonia converters for the agricultural industry, giving a description of the operation of the unit and the handling of aqua ammonia. Copies are available by writing to J. C. Carlile Corp., 425 Cooper Bldg., Denver 2, Colo.



A faster, cleaner and more economical way to pack aerated materials into multiwall valve bags has been made possible through the development by St. Regis Paper Company of Filtovent tape, designed to overcome production difficulties caused by the escape of air from a multiwall valve bag when aerated materials were being packed into it. Filtovent tape, placed on one or both ends of the bag, is perforated, and allows air to escape between the stitch lines and through pinhole perforations.

Stephens-Adamson Has New Tripper

A new, belt conveyor tripper accommodating long center roll, deep-troughing idlers has recently been developed by Stephens-Adamson Mfg. Co., for use with belt conveyors handling light materials. By changing drive mechanism from shaft to chain transmission, the tripper not only clears 45° and 35° grain-type idlers, but also keeps headroom requirements to a minimum.

A self-propelled unit, it has a manually-operated friction drive which allows travel against and with direction of belt travel. Other features include heavy gauge steel unit construction, Sealmaster main bearings and choice of left hand or right hand operation.

For further information concerning the new, Style No. 55 belt conveyor tripper, write for Bulletin No. 156, Stephens-Adamson Mfg. Aurora, Illinois; Los Angeles, California; Belleville, Ontario.

Offer $20 Share For Fulton Bag

A majority of the Board of Directors of Fulton Bag and Cotton Mills, Atlanta, Georgia, April 17 accepted an offer by Shuford and Associates, Atlanta, to purchase Fulton stock at $20 per share. The offer is being submitted to all Fulton stockholders.

Shuford and Associates is composed of A. A. Shuford, Jr., Shuford Mills, Inc., Hickory, N. C.; Julius Abernethy, Carolina Mills, Maiden, N. C., and Moses Richter, United Mills, Mt. Gilead, N. C. Shuford and Associates stated the group will continue operations of Fulton Bag and Cotton Mills without interruption.

Those presently serving on Fulton's Board of Directors, or in management, who have signified their acceptance of this offer as stockholders include: R. O. Arnold, Norman E. Elsas, J. D. Robinson, Clarence E. Elsas, Francis Storza, William E. Mitchell and Herbert E. Elsas, Atlanta and William N. Ganks, Newnan, Ga.

Fulton since 1868 has been identified with manufacturing of cotton, burlap and multiwall paper bags, as well as numerous other cotton, paper and canvas items. Its manufacturing plants are in the following cities: Atlanta, St. Louis, New Orleans, Dallas, Minneapolis, Kansas City, Denver, Los Angeles and Savannah. Sales offices are located in New York City, Chicago, Oklahoma City, Phoenix, San Francisco and Winter Haven, Fla.

CLASSIFIED ADVERTISING

For Sale, Exchange and Wanted Advertisements, same type now used, EIGHT CENTS a word for one insertion; TWELVE CENTS a word for two insertions; FIFTEEN CENTS a word for three insertions, and FOUR CENTS a word for each insertion more than three; ADVERTISEMENTS FOR THIS COLUMN MUST BE PAID IN ADVANCE.

WANTED TO BUY: Box Car Power Unloading Scoop (or Plow). Also interested in elevators, screens, tailing mills, tractors. Send description and prices to Kickapoo Fertilizers, Hillsboro, Wis.

WANTED: Good used 1 Ton Fertilizer Mixer, please state condition, location and Price. Box 101, c/o Commercial Fertilizer, 75—3rd St., N. W., Atlanta, Ga.

FOR SALE: Payloader HAH (high lift)—Guaranteed excellent condition. Brand new FC engine rotated to this machine. Not moved since second set power tires put on. This is a bargain. $2600.00 Cash-here. Ohio Valley Fertilizer Corp., Maysville, Kentucky.

FOR SALE: Slightly used Fischer and Porter automatic flowraters. One for nitrogen solutions, 1,500 to 15,000 pounds per hour range; one for sulfuric acid, 800 to 8,000 pounds per hour. Complete specifications on request. Simonsen Mill, Quimby, Iowa.

FAST SERVICE
on
BAG CLOSING MACHINES

Class 50600

Service also on Class 60000 D and Class 14500.

R. SAM WILLIAMS & SON Winder, Ga.

"Known Throughout the Industry for Exceptional Bag Closing Service."

FOR SALE: Rotary Dryers 5' x 30', 5' x 40', 4'6" x 50', 5' x 67', 6' x 60', 9' x 80'. (1) Pressure Tank 13,000 gal. 220#. Also Mixers, Storage Tanks, Screens, Elevators. Send us your inquiries. Brill Equipment Company, 2402 Third Ave., New York 51, N. Y.

FOR SALE: (4) Sprout Waldron Ribbon Mixers, 336 cu. ft. (12,000 lb.) working capacity. Rotary Dryers, 3' x 25'; 4' x 30'; 4'6" x 40'; 5'6" x 50'; 6' x 40'; 104" x 70'. Also Hammer mills, Pulverizers, Bucket Elevators, Screw Conveyors, Bulk-Flo Drag Conveyors, etc. Perry Equipment Corp., 1426 N. 6th St., Philadelphia 22, Pa.

BUSINESS OPPORTUNITIES: Experienced machinery salesman with following to sell large line of conveyors, bucket elevators, crushers, feeders, vibrating screens, conveyor belting, gear reducers, motors. BONDED SCALE AND MACHINE CO., 111 Kingston, Columbus, Ohio.

SITUATION WANTED: Managerial position, thirty years experience in fertilizer industry, covering accounting, plant operation, superintendent, plant design and construction. Now managing business of 100,000 tons annually. Desire connection where wide experience will be compensated. Will consider adequate base salary and participation in profits. Also making some investment. Box 28, Commercial Fertilizer, 75 Third St., N.W., Atlanta 8, Ga.

WANTED: Man with experience in operating Sulphuric Acid Chamber Plant. Must assume full charge of plant located in the Mid-West. Reply to Box No. 29, c/o Commercial Fertilizer, 75 Third St., N.W., Atlanta 8, Ga., giving qualifications, age, experience, personal history and salary expected.

AGRICULTURAL SALESMEN

Experienced in selling nitrogen products or other fertilizer materials to fertilizer manufacturers required.

Salesmen are expected to become familiar with the technology of ammoniating solution used in mixed fertilizer manufacture.

Duties will be to sell the company's nitrogen products to fertilizer manufacturers.

In reply state personal data, education, experience, and salary requirements.

Inquiries held confidential.

Address reply to:

SOHIO CHEMICAL CO.
Industrial Relations Div.
Box 628
Lima, Ohio

WANTED WANTED
CHEMICAL ENGINEER
FOR
FERTILIZER TECHNICAL SERVICE

A ground floor opportunity for a Chemical Engineer with experience in fertilizer production to handle technical service in North-Central area. This is the first such position in a rapid growing Chemical Company. It entails location in the area to work with field sales forces and reporting direct to headquarters office in New York. Moderate traveling. Kindly submit complete background information and if convenient, a photograph. All replies will be treated confidentially.

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Division Of
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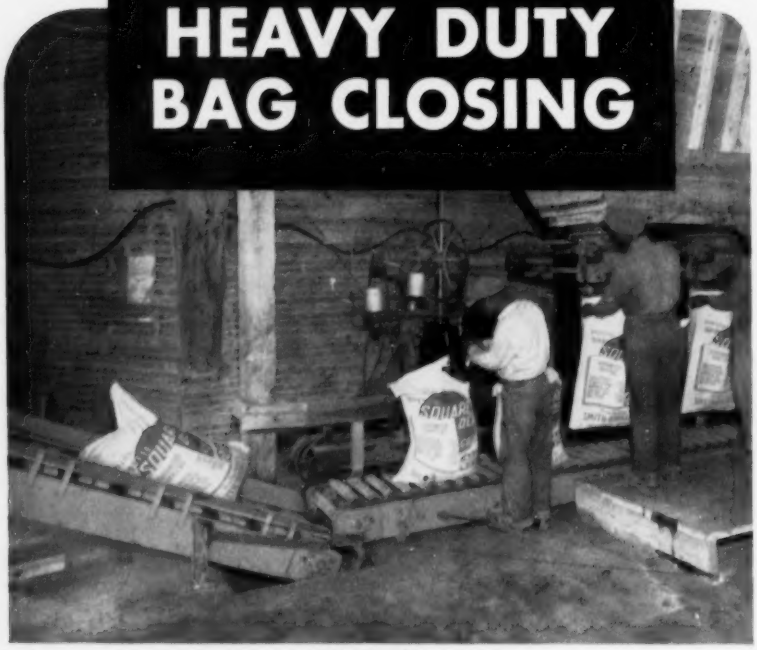

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Union Special® equipment!

UNION SPECIAL builds sewing heads and auxiliary equipment for closing all types and sizes of filled bags. These sewing heads set the standard the world over for speed, economy, and dependability — wherever the product is bagged. They stand up longer in all kinds of service and under the most severe working conditions. They are capable of high production day-in and day-out. For detailed information, ask for a copy of Bulletin No. 200. See our nearest representative or write today.

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This heavy duty unit is designed for closing 100 lb. textile or multiwall paper bags at rates up to 3,840 bags per 8 hr. day. Gear driven horizontal and inclined conveyor. Counterbalanced sewing head easily adjustable for height of bag. Sewing speed synchronized with conveyor speed. Choice of controls.